

April 15, 1957

50 Cents

AVIATION WEEK

A McGRAW-HILL PUBLICATION

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In Systems Concept

Lockheed X-17 With Booster



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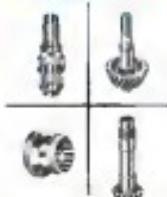
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This man is hard to please. Nothing short of optimum accuracy and conformance to specifications satisfies him. We like it that way, and are glad we have many more people in the Inspection Departments here at Foote Bros. just like him.

Metrical and exhaustive inspection is an important part of our production processes. It must be, because quality production of precision gears and rotating mechanisms for the aviation industry is our business.

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To Fly on The Boeing 707



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The Boeing 707, commercial jet transport, will fly with the most advanced type of ice protection on all three leading edge surfaces of its large empennage.
Guarded by Goodyear!

Radiating revolutionary circumferential systems of ice protection — developed through the teamwork of the National Research Council of Canada and Goodyear — one system of the Iceguard has already been in lengthy service above the Arctic Circle in the Canadian Avro CF-105 all-weather fighters.

Now the other has been adopted by Boeing for jet transport service.

For information on the erosion-resistant Iceguard—how these two systems of Iceproof ice protection can be applied to airframes, wings, propellers, antennas, pipes, condensate—wherever ice presents a problem—write: Goodyear Aviation Products Division, Akron 15, Ohio, or Los Angeles 54, California.

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AVIATION CALENDAR

(Continued from page 3)
April 10—August Encounters, Mountain Hilton Hotel, Elkhorn, Wis.
May 1-2—1962 Visual Meeting, Las Vegas and Area, Statler Motor Hotel, Denver, Colo.

May 2—Aircraft Engineering Aspects of Aircraft and Missiles, American Society of Electrical Engineers, Johnson Hotel, Denver, Colo.

May 3-4—Aircraft Electrical Equipment Conference, Ward Schenck, Dayton, Ohio.

May 7-8—Spring Assembly, Auto Techical Committee for Automobiles, Ambassador Hotel, Los Angeles, Calif.

May 8-9—National and National Turbine Aircraft Helicopters Society, McCormick Park Hotel, Washington, D. C.

May 11-12—National Conference on Aerospace Electronics, Sponsored by the Institute of Radio Engineers, Detroit, Mich.

May 14-16—Aerospace Quality Control Seminar, Sponsored by Frost & Whittier Aircraft Division and distributor Pacific Aviation Corp., Cooperstown Hotel, Denver, Colo. Other sessions May 17 at Ambassador Hotel, Berlin, Calif.; May 18 at Hotel Chateau, Oakland, Calif.; and May 19 at Nov. Washington Hotel, Seattle, Wash.

May 13-15—3rd Annual Conference on Transport Division, American Society of Civil Engineers, Park Sherman Hotel, New York.

May 20—21—Annual Aviation Fire Safety Seminar, National Fire Protection Assoc., Sheraton Los Angeles Hotel, Calif.

May 24-June 2—2nd Paris Air Show, to early of French Aircraft Constructors, Le Bourget Airport, Paris.

June 1-7—Aerospace Materials, Components, and Operations Meeting for Avionics and Electronics, Aercom, sponsored by Remington Avionics Service, Remington Motor Hotel, Argon, Pa.

June 13-15—Annual National Aviation Trade Show, Minneapolis Convention Center, Minn.

June 17-20—National Source Meeting, Institute of the Acoustical Sciences, Biltmore Hotel, Los Angeles, Calif.

June 21-23—1962 National Meeting, Aviation Distributors Association, Milwaukee, Wis., The Sherman, Coeur d'Alene, Idaho.

June 24—Seventh National Aviation Day, Atlanta.

July 12-13—12th Lockheed International Aerobatic Competition, The National Air Races, Belmont Airport, and the Range City Airport, Glendale, Calif., Aerostar, Bakersfield, Calif., England.

Aug. 20-23—Western Electronic Show & Exposition, Cox Palace, San Francisco, Calif.

Sept. 1-British International Aerospace Conference, Royal Aeronautical Society and Institute of the Royal Astronomical Society, Farnborough, Hants, England.

Sept. 24-25—1962 Flying Display, Society of British Aircraft Constructors, Farnborough, Eng., England.

Nov. 7-8—Wichita Service Management Week, Wichita, Kan., Wichita, Kans.

Dec. 3-7—1962 Berlin Letters, Department of Commerce, Auditorium, Washington, D. C.

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The production engineer who has lost his enthusiasm for whittling metal. Machining from solid bar is still his accuracy when making one part or a few prototypes. But, for hundreds of parts, extruded shapes save cost and machining time.

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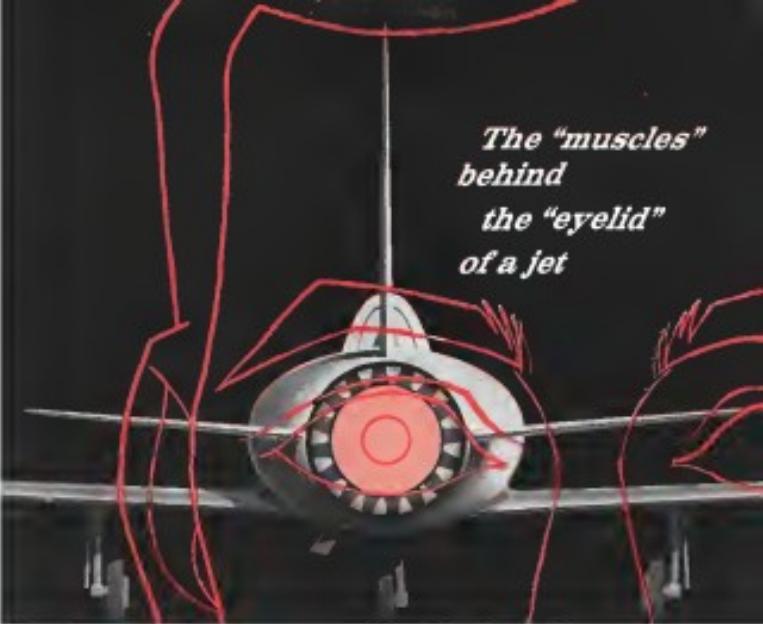
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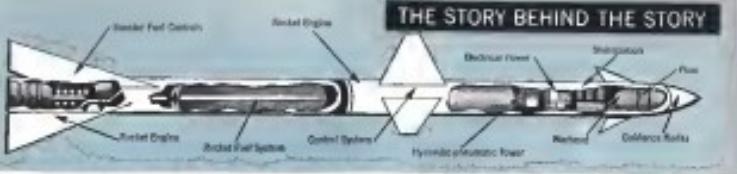
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of a jet*

Jet aircraft using the "eyelid" type of variable area exhaust nozzles need actuators—or "muscles"—that respond instantly in temperatures ranging from minus 67 to plus 600 degrees. Ex-Cell-O builds such actuators . . . along with nozzles, blades, rotors, fuel controls, precision parts and assemblies.

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THIS AIR AND MISSILES FLY HIGHER, FASTER AND SAFER WITH PARTS AND ASSEMBLIES BY EX-CELL-O.

2342



THOUSANDS OF "WRECKS" can develop in a guided missile, each capable of causing 10 miles or more of damage. Pre-launching

check-out takes specialized techniques—many hours. Under stress of enemy attack, a small but fatal error might be fatal.

IN MINUTES, NOT HOURS, all critical parts can now be checked by simple push-and-go procedures—simply by pressing buttons on track-mounted RACE systems. Converted to missile, RACE furnishes diagnostic facilities—an electronic-like system which automatically spots faults and initiates repair procedures.



"RACE" TO BOOST MISSILE STRIKING POWER

Electronic System Cuts Launching Time, Ups Dependability

While a rifle bullet strikes you simply like another. Guided missiles, however, are costly and complex, packed with precision parts in hard-to-adjust. When these "birds" take off, they've got to fly right the first time!

At present, making raw missiles properly prepare takes hours, even days, of careful wiring by highly trained men. And under the stress of aerial combat, the best-trained crew might neglect an important check-point—and there are thousands of potential trouble-spots in a typical missile.

Sparton's new missile testing system called RACE does the job in only minutes—with little chance for error. RACE (for Rapid Automatic Check-out Equipment)

tests all missile components at the launching platform, warns of the testing faults, even tells the operator how to fix it. And RACE doesn't make a mistake because it checks itself while it checks the missile. Result is, missiles are ready to launch far quicker and are more likely to perform with full effectiveness.

Designed to test supersonic aircraft as well as missiles, RACE will strengthen our national defense by keeping key weapons fit to fight.

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AVIONICS . . . from A not quite to Z

THREE big products for missiles, aircraft or commercial applications with which Bell Aircraft's newly-formed Avionics Division is concerned does not quite span the alphabet. It ends with VHF. But it's all inclusive and complete—indicating a highly experienced organization capable of designing successfully with any of the hundreds of electronic, electro-mechanical or mechanical systems and devices which make up the field of Avionics.

It has creative engineering ability for research and development—and efficient manufacturing facilities. It is responsive to design and produce

complete systems—or independently operating units for such systems—or components for both.

It is an organization with size and resources to qualify for aerospace projects—with easy access to areas of its capabilities. One of its areas of development is in the Navy's Automatic Carrier Landing System which makes precision landings possible with zero-visibility conditions.

The services of this organization are available to defense agencies, prime contractors and commercial organizations. If you have problems in Avionics, Bell engineering representatives are at your service to help resolve them.

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This new AMP pneumatic hand tool augments our line of high-speed application tooling. Designed for a wide range of AMP terminal, connector and splice applications, its features includes:

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- Standard "C" type head adaptable to all types of crimping, including small wire terminations in close working quarters;
- Spring and air operated holding device for positive grip-page of terminal in tool head prior to crimping;
- Safety engineered to prevent accidental operation of tool during insertion of terminal or connector between crimping dies.

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From MOOG... Advanced Electro-Hydraulic
Servo Components

Moog is the industry's leading producer of electro-hydraulic servo valves. This leadership has been achieved by advanced valve design resulting in high performance, high quality, reliability and efficient manufacture. The same creative approach applied to industry's newer

problems has resulted in the introduction of Moog Dual Input and Servo Actuator units.

These recent achievements in the creation of advanced custom designed electro-hydraulic servo components are evidence of Moog's continuing progress.



SERVO VALVE

* These proportional "dry motor" electro-hydraulic servo valves feature high dynamic response, sensitivity, linearity and repeatability. Liquid-filled and dry-motor types are also available as custom designed servos for general or advanced applications.

DUAL INPUT SERVO VALVE

- This new component provides for positioning of aircraft control surfaces by means of proportional and discrete inputs without external use of mechanical linkages. Use of an entirely new design offers significant improvements in system modularity and savings of space and weight.

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- Custom designed integrated assemblies include straining element cylinders, solenoids with built-in feedback sensing devices. In a closed loop, actuator assembly provides a function of input signal.

TO THE ENGINEER IN A "HURRY"

Anonymously, to all engineers in a hurry, you get ahead connecting that servo proxy foot.

If your "anonymity" is a cover as engineer, contact Moog. From those founders of the highly regarded producer of advanced electro-hydraulic servo components. Our engineers made this possible by continuous pioneering of the new and successful developments in the field. As our expert engineers maintain, we have many engineers at all levels for qualified personnel.

But time to get ahead is now.

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Beware of the Shark!

The nation's first intercontinental missile... the Air Force's Northrop **Shark** SM-62. Equipped with a nuclear warhead, the **Shark** is a soundless air-breathing missile which travels in the earth's atmosphere. Its unique design presents a smaller target for radar, interception, or anti-aircraft missiles.

Extremely mobile, the **Shark** can be air lifted to any site within a few hours.

The piloted booster is powered by a Pratt & Whitney Aircraft J-57 turbojet engine equipped with a Holley compressor bleed governor. It flies an impressive 5000 miles where the weather over the longest range you possibly fly in the free world today.

Like all Holley engine controls, the compressor bleed governor is dependable, easy to service, compact and lightweight - four vital qualities for aviation equipment.



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When the nozzle fire extinguishing system is put out the blue.

During any gradual temperature rise above maximum normal, the ABNORMAL TEMPERATURE signal remains operative all through the rise, and is replaced by the FIRE ALARM when a predetermined fixed fire temperature has been reached.

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Formation of a three-man Airways Modernization Board as proposed by President Eisenhower by Edward P. Curtis, his special assistant for aviation facilities planning, is a strong step toward ultimate solution of the air traffic control problem.

This board can avoid many of the administrative deadlocks and pitfalls of the previous government authorities that have whirled so long without much positive result. It can also serve an extremely useful function in keeping the development and coordination of a joint military-aircraft traffic control and navigation system going in the interim that will inevitably occur before a major and final overhaul of the government aviation agencies can be accomplished.

Interim Nature

It is necessary to understand the essential interim nature of the Airways Modernization Board if its value is to be insured properly by the industry and government agencies concerned. The AMB cannot be of any immediate help in bringing the traffic control crisis. That is the job of the Civil Aeronautics Administration.

Improvements during the next 18-36 months are dependent on the programs proposed by CAA Administrator for James T. Fife for which appropriation requests are now before Congress. If the Congressional critics of the traffic control board were to appropriate funds they can best insure it will support the current CAA airways and airframe appropriation requests.

Nor can the AMB insure the emergence of the ultimate integrated navigation and air traffic control system that will be required in another decade to handle the true problems of a vastly expanded civil air traffic and an infinitely more complicated air defense problem. That can come only after the major overhaul of government aviation agencies has been completed. We expect Mr. Curtis will have more to say about this integration in his final report to the President.

Readers of Aviation Week will find no startling surprises in the interim report of Mr. Curtis. He notes, as we have informed during the past several years, that the air traffic control problem is genuine and will grow worse if not dealt with promptly. "The alarm which has been raised in the past four years seems in fact supported by evidence that our airports and terminals are subject to increasing congestion," Mr. Curtis reported to the President. Mr. Curtis also renews his contention that the principal enabling block in achieving more progress in this field is not technical development but the administrative will of the current interagency mechanism of the federal government.

"I found there was no lack of scientific ideas," Mr. Curtis reported. In fact, an overabundance of directions

systems had been developed in the laboratory to improve our terminal and en route operations. Most of these have been drafted and never used.

The key to the dilemma can be found in the organizational arrangements in the executive branch which are intended to set goals, to develop and to select the systems and methods which will meet these goals. The problem of overseeing the service was clearly recognized in 1941 as one that required urgent action. The actions taken since then have not been effective.

The direction AMB with one representative each from the Department of Defense and Commerce plus a number of randomly appointed officers should avoid the administrative difficulties that plagued two earlier air navigation development boards and created the bitter Trans-VAL/DEME battle. At the same time that new AMB will not interfere with the specific programs CAA, under the leadership of Fife, is already pushing to one the traffic control program during the next few years. There is a "gap year" when the current CAA programs end and the new AMB proposed program would begin to intersect. But with the present CAA leadership and the will to make progress that must dominate the air, AMB, the probably will not become a serious problem.

Technical Forum

The new AMB will not and should not prevent strong arguments over the relative merits of various proposed navigation and traffic control systems. This type of technical debate is vitally necessary to stand progress. What the AMB can do is to provide a universally recognized forum for these debates and the mechanism of getting quick, sound decisions on the controversies.

The private pilots, airline passengers, airline crews, USAF and Navy and all of the other elements that want and need a progressively improving solution to the traffic control problems now have a clear cut program that they can support.

First and foremost they should push for complete and speedy execution of the current CAA programs that will facilitate cooperation in the air for the next two to three years. Second they should push for the creation of the Airways Modernization Board, as proposed by Mr. Curtis and recommended to Congress by President Eisenhower and support this board fully when it brings out action. Third, they should work with interest in Mr. Curtis' final report to the President on the major overhaul of government aviation agencies regard for the ultimate solution of the problem.

—Robert Hots



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WHO'S WHERE

In the Front Office

William E. Zender, formerly senior vice president and director of Illinois Manufacturing Co., a division, Kaiser Corp., Los Angeles, Calif., has been appointed

John M. Faust, M. founder and board chairman, elected president of Fairchild Camera and Instrument Corp., Everett N.Y. Mr. Faust succeeds John H. Chappell, resigned.

Robert F. Goss, vice president, Tipp Insulators Inc., Beverly Hills, Calif.

Gen. Leavenworth C. Daugherty (USAFC ret.) appointed Defense Contract Support Director, American Maritime & Transport Co., Los Angeles, Calif.

Andrew H. Ferguson, vice president, Western, D. G. office, Boeing Co., Seattle, a division of General Dynamics Corp., Seattle, N. W.

Robert P. Williams Jr., Washington, D. C. representative, Kellott Aircraft Corp., Houston, Tex.

Col. Norman F. Black, USAF, has been selected to serve as chief of the Washington D. C. office, American Airlines Division of Pan Am, Dulles, Calif.

Honors and Elections

Dr. John T. Keilholz, president of the new University of Worcester, has been named chairman of the board of trustees for the Art University at Newark, Art Institute, N.J. The board, whose membership is at the discretion of Gov. Nelson A. Rockefeller, has appointed Dr. Keilholz as its chairman. Dr. Keilholz is a professor of electrical engineering at Worcester Polytechnic Institute.

Richard H. Stansfeld, electrical design engineer at Douglas Aircraft Co., has been elected president of the Annual Electrical Society for 1957. Vice-Pres. Steven died at the recent Design Seminar of Douglas, vice-president.

Prize Town, Ind. pilot, Mr. The Farnsworth Co. Ltd., has received the Sigma Trophy which is awarded annually to the British who make the most original and outstanding contribution to the development of flight by land, air or water.

Beech Flying Engineering Section head, search committee chairman of Space Research Group, has elected president of America's Astronautical Society for 1957.

Changes

Vance Dohmen, factory manager, Convair, a Division of General Dynamics Corp., San Diego, Calif., has been promoted to manager of the San Diego plant, assuming responsibility for all operations of the plant except those of the Convair Division, San Diego, Calif. Vice-C. C. Wolday and Kenneth D. Gordon have been added to the 550-man management staff. K. H. Campbell will assume Mr. Makinson's manager of Convair Division, San Diego, Calif.

John C. Hause, former sales manager, Detroit, Glaz office, Light, Mobile, Electronic Equipment Dept., General Electric Co., Union, N. J.

INDUSTRY OBSERVER

► Republic Aviation Corp.'s F-107 program includes design projections for seven versions of the four-seat fighter-bomber, including stratospheric, transonic, low altitude, low speed attack and high altitude. The aircraft, which is powered by a 14,000-lb. thrust, large external stores, one under the belly and one under each wing.

► Three prototypes of Convair's B-58 supersonic bomber are now being flight tested from the company's Fort Worth Division. Top speed of the aircraft is approximately Mach 1.7.

► Third-stage rocket motor of Prancer Vanguard developed by General Electric Co. completed prequalification tests. Motor is being static tested by Glenn L. Martin Co., prime contractor for Vanguard, at USAF MacDill Test Center, Orlando, Fla.

► Bell Helicopter Corp. has installed a new two-bladed rotor system on its model XV-3 and will test it as a possible alternative to the conventional three-bladed system. The modification will be shipped to National Advisory Committee for Aeronautics' Ames Laboratory at Palo Alto, Calif., for wind-tunnel testing.

► Beech and Grumman are considering the Continental T-34 600-hp turbine engine for small twin-engine executive aircraft projects both companies now have on the drawing boards.

► Convair's Pomona, Calif., missile facility is considering the redesign of the guidance instrument in view of Navy's Torpedo surface-to-air missile to eliminate unbalanced condition obtained with conventional suspension.

► Kellott has replaced the rotary packet engine in KH-15 cameras with a compact light weight propulsor enabling heavier or heavier payload advantage—extended flight duration and decreased cost.

► Curtiss-Wright Corp. is looking for new plant acquisitions, particularly equipment companies, with an annual sales volume, or foreseeable potential, of at least \$5 million.

► Standard Research Institute is conducting research on steel fracture for the Naval Ordnance Test Station, Glass Beach, Calif. Steel fracture of explosives on rods of high-speed research steel rods is one of the basic problems in steel work.

► This pattern of the bending of stainless steel wires in rod supports used in the Convair-USAF 104 cruise research test at USAF Flight Test Center, Edwards Air Force Base, Calif., indicates that the rod actually fails as a series of local bends, which act as a liquid lubricant between the slider and track ends. Plates extended more than nine feet behind the sliders last diagonal rod was completely bent when the rod entered insulation around a portion of the track.

► Work is scheduled to begin next month on the construction of technical facilities at Camp Creek, Calif., in connection with rehabilitation of the site for USAF's future missile training program.

► unusual degree of dual-military-industry cooperation is indicated in the three effort to solve the tough airborne proximity warning electronic avoidance problem. USAF's Wright Air Development Center, which may soon launch a program at Beale, Calif., is working closely with the Air Transport Assoc., and avionics manufacturers are freely exchanging the results of their studies of the problem, releasing data which naturally is classified proprietary.

► Arrest-General Corp. has completed preliminary planning study for damage potential test, recently contracted at USAF Aerospace Center, Wright AFB, Fla. (AW 46 p. 311). Chicago Midway Laboratories is participating in a continuing test vehicle development program for the track.



HOW THE SILICONES MAN HELPED...

Build a Gyro for Straight Shooting!

Accuracy that could hit a fly from a swimming pool master... so rugged that it can be used to drive wells without impairing its operation. That's the "impossible" free coated gyro built by Minneapolis-Honeywell, Aerometric Division. Known as the HBG-5 (Hercules Interpreting Gyro), lightweight and small enough to hold in the palm of your hand, it supplies the "sense of balance" necessary at supersonic speeds.

Operating in a vicious fluid under wide fluctuations of temperature and pressure, such can be less than perfect. What material was used? "It's made of UNION CARBIDE Silicones Rubber."

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Under such rigid tests, Union Carboe Silicones Rubber showed outstanding sealing qualities and resistance to compression set.

This is another example of how the UNION CARBIDE Silicones Man has helped solve an "impossible" problem. A booklet—"Tools to UNION CARBIDE for Success"—describes silicone rubber and many other silicone products. Write Dept. AW-44 today. Silicones Division, Union Carbide and Carbon Corporation, 39 East 42nd Street, New York 17, N. Y.



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Washington Roundup

Threat to NACA

National Advisory Committee for Aeronautics' long-standing program of contracting with universities and other institutions for research in meeting strong opposition to Congress.

The House, on the recommendation of Rep. Albert Thomas (D., Tex.), has voted to ban the program. Not long ago NACA's request for \$770,000 for contracts during fiscal year 1959 turned down but the authority for aeronautic contracting was withdrawn. Thomas has introduced an appropriations amendment to discontinue the NACA contract.

The matter is now pending before the Senate Appropriations subcommittee headed by Sen. Warren Magnuson (D., Wash.), who favors the program to train future college students, professors and scientists possessed with NACA activities.

More USAF Shifts

Major personnel USAF shifts that began with the elevation of Gen. Nathan F. Twining to chairman of the Joint Chiefs of Staff are continuing. After job still open as commander of Strategic Air Command, Twining's next assignment is promotion of Gen. Curtis LeMay to USAF vice chief of staff. Lt. Gen. Guy Ford, Biwer, a close associate of Gen. Twining, is expected to get the job although other sources believe Lt. Gen. George C. McGovern and Lt. Gen. Louis G. Dennis favor him. Both of whom have had extensive SAC experience. Col. McElroy's command Other shifts include Brig. Gen. Anne Leshem to succeed Brig. Gen. Andrew Kostey in USAF information that Lt. Col. William Turner to succeed Lt. Gen. Joseph Jacobs as commander of Military Air Transport Service; and Lt. Gen. Frank Griswold to become commander of the Tactical Air Command.

In a committee session, when noting the down grading of Russian strategic air power in U.S. intelligence reports for the past year, Ellender commented that "I hope we're getting better intelligence information." He said that he might be in a position before we proceed to expand or to cut and spend all the money we are."

Dr. James Brookfield, chairman of National Advisory Committee for Aeronautics replied: "We would like to have more accurate information. But I would not write off the information what we have as being wholly inaccurate."

Supplemental Proposals

Proposals for two new types of supplemental scheduled air service are circulating vigorous opposition.

* Senator G. Tipper, an Transport Area president, argued that Civil Aeronautics Board's plan to award "capable" certificates with limited frequency specifications to irregular air carriers would force Congress to regularize air routes under the Senate's proposed "airline" legislation. Senator Tipper, however, has been told by Sen. A. S. Mike Monroney (D., Okla.)

* Capt. Edie Riedenboker, Eastern Air Lines' chairman of the board pointed out that "flexible certificates permitting scheduled carriers to shift operations to handle heavy seasonal loads" would result in a total blight of air routes as carriers chasing "the weather bird." Riedenboker's protest was contained in a letter to Sen. George Smathers (D., Fla.), a member of the subcommittee who suggested this type certificate to CAB.

At both Transport Area and Independent Airlines Air Transport Area testified in support of the CAB proposal for limited certificates. Tipper stated that with authority for limited certificates, CAB could reorient the certificate of local service basis, helicopter operators, and cargo carriers, limiting their frequency of operations to types of traffic.

Riedenboker told Smathers that his suggestion of flexible certificates "pertained to handle heavy Florida winter traffic"—an already bad enough proposition.

—Washington staff

Scientists Clash with Newbury on Policy

Defense Department advisors fear oblivion under new regime, some see trend as security threat.

By Claude Wiles

Washington—The Pentagon's six-month-old Defense Science Board charged with the overall guidance of the long-range military research program in America's defense industry under the aegis of Frank D. Newbury, new Assistant Secretary of Defense for Research and Engineering.

Admirers Within learned from reliable sources that a crisis is the life of the board, which is presently composed of 20 top U.S. scientific leaders at a closed meeting April 16 where a substantial number of the members heard Newbury suffer his program.

The board members, like the Parisians who died in the day following when they discovered the "legitimacy" in what was at the time the world's bloodiest field, told Newbury that they had as dear in mind as the board if they were not wanted.

The board consulted its regularly-scheduled May 15 meeting and did not recess until, and unless, Newbury calls a session.

Garrisoned by Adm. Arleigh A. Burke, Newbury expressed agreement to a suggestion that one of the board members was dismissed. He said there was no discussion on his part concerning the board's future agenda and that the move to exceed the May 15 session "was that size."

Newbury Not Impressed

Newbury, however, believes that he was not impressed by the board's as spokesman and its importance to carry out the scientific program. He said it appeared "they do not know what to do," but noted that "I have reported nothing into the situation to the other board's strengths."

Newbury said he will reexamine the board's "when I have some problems for them to consider."

From other sources, Adm. Wiles learned that Newbury's "taste and attitude" toward scientific research leave "most of us unhappy."

Solitaires Deeply Worried

And one of the country's leading scientists who took a prominent part in the April 16 session:

"The leadership of the scientific corps is deeply worried. We fear that this Pentagon trend may result in serious damage to America's shutdown of knowledge and increase the safety of our country in the future."

America's members equally presented in the strength field, said one who chose to keep his name out of it, the decision and not let the board fully plan its program.

In this regard, Newbury is considering the appointment of a single advisor to manage systems. At the other board approach of his plan to keep such an role, but it has become obvious that Newbury and the board would make the decisions on what programs held promise, and what projects should be dropped.

Several Defense Science Board members are convinced the board never will meet again. One said he felt Newbury himself will determine the board's future and that he fears the group never will attain the singular and ultimate it was intended to have.

Board's Origin

The originator of the present Postwar planning organization, according to both Dr. Newbury and Defense Secretary Charles E. Wilson, is that there should be no financing for a scientific research project unless it holds promise of providing concrete results directly applicable to the department's mission.

The board's charter, influenced by Dr. Fauci, is not incompatible with the Sorenson-Wiles philosophy. It says, the board shall devote major attention to developing the scientific opportunity that hold promise of clearly establishing present or prospects of value.

The others also call on the board to give specific attention to research and development stages, the integration and administration of basic research, conceptual research, advancement of the state of the art, and the coordination of research and development in preceding combat weapons weapon systems."

Advisory Power Only

Washington—Frank D. Newbury, Assistant Secretary of Defense for Research and Engineering, believes it is administratively impossible to decide a program of basic research and development, that is, decisions whether it is worthwhile to the Defense Department for its potential contribution to national security.

On the day hand, he said, the National Security Industrial Assn. has work he has found it psychologically or politically important to handle the review and evaluation of a research and development project in a single package.

The same, the research units while important, would be small in numbers,

Thus his emphasis is industry. Newbury feels that, "when research and product development or expenditures of the same working group, the more intelligible research activity usually follows" he made in Newbury and a no

go research silence working in the central Pentagon atmosphere. One in point:

"The members of the board feel that the civilian scientist should work their science and that he should go a clear and problem and air on their science responsibilities. This does not appear to be his intention at the present time."

What we are most concerned about is the general air of cutbacks in view of the constant emphasis on economy. Some terrible mistake has to be made here—mistakes that will endanger our country's future scientific security."

One of the faults Newbury found with his board's organization was that it is a permanent committee. Dr. Fauci, Dr. Wiles, and myself, for instance, would be leaving the Defense Science Board in return to my post as director of the University of Buffalo early this year. He left the chairmanship open so that his successor would be free to make the choice. At that time, Dr. Fauci did not expect that his successor should be chairman and the duties turned over to Newbury.

What Board Accomplished

From the April 1-4 session, which was called in an extraordinary meeting by Newbury to explain his program, the board had held three other meetings.

A well-known observer said a "good deal was accomplished in terms of background work and putting up the funds in research and development." Thus has been some work done on the start of a program to improve navigation of programs carried on by the defense services.

So far, DSB had gone no considerable time to the question of which projects should be eliminated from Defense Department sponsorship.

It is charged by many that the Defense Ministry must be writing off unarmed fighters and bombers a greater sum too soon. Mr. Frank Spragg, managing director of the Hawker Siddeley Group, agreed.

In his opinion, there certainly should be a reduction of strength in the English Electric's Avro 721 and another generation of supersonic manned bombers after the Victor and the Vickers.

May See Self Fighter

Newbury has announced that WADC will announce the decision this week, and that the Cope-Vale prototype will be operational at the center.

Boring Aerospace Co. has ordered the first production model Cope-Vale Avro 721 which is delivered. It will be used at Boeing's Thorntown Division plant at Reichenbach, West, where the 721 and KC-135 are in production.

Defense Science Board Members

Washington—Acting Chairman of the Defense Science Board at the Pentagon meeting April 4 was Dr. Franklin L. Hovey, President of Peabody University, Everett, Ind. Dr. Hovey is also Chairman of the Army Strategic Advisory Panel. Other members of the committee present included:

• Dr. J. A. Stebbins, director of the Massachusetts Institute of Technology and chairman of the Naval Research Advisory Committee.

• Dr. James H. Shoolery, vice president of Shell Oil Co. and head of the Air Force Scientific Advisory Board. He is also chairman of the National Advisory Committee for Aviation.

• Dr. Alan L. Waterman, director of the National Science Foundation.

• Dr. Alvin V. Astan, director of the National Bureau of Standards.

• John W. Connor, director director for research of NASA, serving in alternate to Dr. Hugh L. Dryden.

• Dr. Charles C. Parsons, former director of Defense Science Board Development and chairman of the University of Buffalo.

• Dr. Ernest E. Heath, vice president and physico-mechanic of the Rockwell Institute.

• Dr. E. Rietz, vice president and general manager of mobile networks Lockheed Aircraft Corp., acting as alternate to William Lifton, vice president of Aviation Airlines.

• Dr. Peter Rivers, executive vice president, Ericsson Research & Engineering Co.

• Dr. Elmer W. Engstrom, senior associate vice president, Radio Corp. of America.

• Dr. W. J. Storrs, vice president, Ericsson Research & Engineering Co.

• Dr. Zane Jeffries, vice president (int'l), General Electric Co.

• Dr. Edward T. Roberts, California Institute of Technology, a alternate to Dr. L. E. J. Hampshire, vice president, Norden-Kennecott Corp.

• Harry A. Wiles, vice president int'l, General Electric Co.

• Dr. Fred M. Felt, Ohio State University.

Also members of the board but absent at the April 4 meeting are:

• Dr. Richard A. Kern, Temple University.

• Dr. William Schlesinger, Stanford University.

• Dr. George W. Bush, president, National Academy of Sciences.

Sandy's Defense Policy Criticized

London—Criticism of Defense Minister Denis Smith's new defense policy focusing graded nuclear war instead aircraft has been widespread, especially among British aircraft manufacturers.

It is charged by many that the Defense Ministry must be writing off unarmed fighters and bombers a greater sum too soon. Mr. Frank Spragg, managing director of the Hawker Siddeley Group, agreed.

The new British defense policy also is expected to be held offshore at the meeting of the North Atlantic Council on April 16, the English Electric's P1 and another generation of supersonic manned bombers after the Victor and the Vickers.

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Studies also have been passed. The actual cost is

even larger than the next, advanced planning had called for spending of \$4.5 billion in the coming year.

Stead's final findings will present various branches of the service will be implemented in British waters. He concluded that an agreement had been reached with the United States to stop phasing out patrols at that type.

British fighters force will be reduced and expand the role of defending border and inland bases. Fighters will be progressively engaged with in training exercises. Stead's final fighters or craft in the course will be replaced by aircraft to guard major routes.

The Ministry did not release reports that the United States also will begin aerial patrols as well as surface patrols, leaving the question still unanswered.

Stead's report said that nuclear warheads are being used by different graded missiles. He and his group also will be given to develop a plan of British nuclear weapons suitable for delivery both by manned bombers and ballistic missiles.

Trans Reduction

Britain will make large reductions in the number of aircraft, naval crews, and men. It will maintain a strong striking force in the North Sea, where one-third of Britain's trade passes through the world's most sheltered fleet of transport vessels. It has been built up for that purpose, Stead reported.

British Second Technical Air Force in Germany will be cut in half. Much

of next year, NATO light bombers planned to be operating at 545 billion in the coming year.

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On the other hand, any decisions to extend the life of existing fighters will be English Electric; an extension to twelve years.

Trans American Prepares to Quit

By L. E. Dury

Washington—Trans American Airlines will bring its controversial air-mail operations to a virtual halt next month with the delivery of five of its DC-10s to Eastern Air Lines under the terms of a six-year lease deal with the Civil Aeronautics Board last week.

The decision to discontinue its entire fleet of DC-10s comes a long, bitter struggle in Trans American to stay in business despite a CAB order almost two years ago revoking the authority of the firm to operate aircraft that operate within the Trans American network.

The action does not necessarily mean the end of the airline since a pending Supreme Court decision could prolong its corporate existence. If this should happen the airline will continue service with its remaining fleet of three DC-10s and one DC-8 in charter and non-scheduled air-mail service to implement what aircraft are generally referred to as Trans's new policy.

Plans to have the DC-10s were taken as a hedge against a possible adverse

decision by the high court. In addition to the initial five aircraft, the DC-10s which Trans American has on order will be leased to Eastern for four years following delivery in early 1976.

Loss Terms

The lease agreement states signed by the two parties of the Trans American group on behalf of Trans American Corp., one of the companies associated with the combine.

Leases are \$51,500 per airplane per month or \$312,500 for rental of the seven aircraft over the five year period.

A Trans American official told Aviation Week that the decision to lease the aircraft to Eastern at this time was made while the company's bankruptcy woes were not yet resolved. "In a possible splitting of the CAB ruling this order."

Eastern Airlines plans to use the same DC-10s as high-density low-cost air-mail service as well as replacement of other aircraft not generally referred to as Trans's new policy.

Third U-2 Crash

A third Lockheed U-2 high-altitude research plane has crashed in eastern Nevada. Cause of the accident, in which Lockheed pilot pilot Robert L. Solar was killed, has not been determined. The aircraft was enroute at Whitepine Strip, Nevada, to Atomic Energy Commission facilities.

First crash of a U-2 near Edwards Air Force Base, Calif., last month, occurred Dec. 19, in Arizona, plane # J-3. Another crashed

ARDC Reorganizes Managerial Offices

Baltimore—USAF's Air Research and Development Command has reorganized a number of offices under the Department Commander for Research and Development, abolishing one directorate and creating four others.

The organization is much more integrated, ARDC said. It is reported to give Brig. Gen. M. C. Bremner, the Deputy Commander for Research, clear authority and resources for what he is responsible and to whom responsible areas officially.

Directorate of Brookhaven, headed by Col. J. R. V. Dickson, has been abolished. Col. Dickson becomes the vice Assistant Deputy Commander for Research and Development Programs Control Directorate of Research and Directorate of Engineering services unchanged.

New Directorates are:

- Air Weapons, headed by Col. B. G. Holman, former chief of the Air Weapons Division of the old Directorate Directorate. This directorate includes all aircraft and the Guidance and Control Branches except its Test Instrumentation Branch.

- Aerodynamics, headed by Col. F. F. Nov. This is made up of the old Aero and Propulsion Divisions, the Aerodynamics Division, and the Solid Propellant and Materials Division, except for Photographic Branch.

- Communications Electronics headed by Col. G. T. Gould Jr., former chief of the old Communications Electronics Division. This directorate includes the Photographic Branch of the old Equipment and Materials Division.

- Human Factors, headed by Col. P. H. Mitchell, chief of the old Human Factors Division.

- Civil Defense, responsible for civil defense coordination between the air directorate, coordination with the other two deputy commanders and advancing Civil Defense on the status and products of the research and development programs.

Curtis Recommendations Go to Congress

By Philip J. Klass

Washington—President Eisenhower served quickly last week to submit congressional authority to create a new Arms Moderation Board. Last June, the recommendations of Edward F. Curtis, the President's special adviser for arms control planning,

he found the proposal "disappointing." However says the "initiated arms" in no way conflict with a "nuclear arms plan and the formation of still another arms control group as board." Curtis' hearings on the bill are not scheduled to begin until late this month or early May.

Three-Measure Board

The proposed AMB would be headed by a three-man board, consisting of:

- Chairman, appointed by the President, not affiliated with any other government agency. Salary will be \$30,000. Curtis says the man selected should have a solid background in science and operations and adds that he is neither qualified nor, he intimates, the new post.

- Secretary of Commerce.
- Director of Defense.

Board actions and policies will be determined by a majority vote of its three members or their delegates. That should obviate vigorous but frequently blocked action in the Arms Negotiations Development Board where Defense and Commerce Departments each had equal votes, and there was no third member to resolve deadlocks.

The new agency is expected to assume some of the functions of the Civil Aeronautics Administration's Technical Development Center, the Air Conditioning Committee, military research and development centers and probably all the duties of the Air Navigation Development Board. Transfer of such functions and in turn those from other government agencies will require the

assentance rate of the three-man board plus Presidential approval.

In addition to the three-man board, the Arms Moderation Act of 1973 would confer the new agency to assemble a staff of scientific and technical personnel drawn from civilian defense planning.

• Civil Service pay to Grade 15 which has a starting salary of \$34,000.

• Outside memberships can be held in addition to up to \$100 per day.

• Uniformed military personnel assigned on a non-duty basis.

Funds for operating the new agency would be appropriated without fiscal year limitation under the proposed bill. The board would be authorized to "rent, lease, acquire, negotiate, subscribe and to purchase or acquire real property" for such purpose. This is to provide a major facility for experimentation and evaluation of new technologies, techniques and methods of management predicted by Aviation Week. Intricate problem of procurement and equipment can be tested jointly and traffic controllers experiment together, linking the data of source to user to move them to practical use.

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Turbo-Rocket Motor

A turbojet motor is being developed by Marquette Aircraft Co. The motor and its powerplants to produce the rocket's propulsive efficiency.

The rocket engine is designed through a turbine wheel which drives a compressor to compress air to take into the rocket through a nozzle inlet. This high pressure air is directed around the rocket inlet and exhausted with the rocket base for thrust.

The motor has been submitted to the atmosphere to provide thrust. The final rocket will consist of a boost motor, the vehicle velocity, increasing propulsive efficiency and providing better fuel consumption.

Marquette is financed somewhat by the system, but it could possibly make the rocket more attractive for propelling long-range aircraft at high speeds.



ATOMIC POWERPLANTS could be incorporated in an aircraft the size of the Martin PBM Seafarmer according to Navy estimates. Initial objectives of the Navy nuclear aircraft development program is a long-range, low-performance anti-submarine, mine sweep training seaplane. Hull design similar to the Seafarmer's would be used for maximum rough water capability.

Navy Aims At Low Power Atom Seaplane

By J. S. Bois, Jr.

New York—Magnitude of nuclear aircraft engineering problems has led the Navy Bureau of Aeronautics to concentrate on the program in a low power low performance seaplane as holding the best hope of early success.

Such a seaplane with practically no limited range and endurance would greatly increase the Navy's antisubmarine and mine sweep training capability. It would provide valuable experience for the design of a more powerful high speed attack plane.

Engineering considerations which delayed the Navy's decision over broadly outlined to the recent Senate of America Engineers National Association Meeting in New York by Commander A. D. Struble, Jr.

Shielding Distribution

One of the major problems over cut zero proper shielding to protect the flight crew and aircraft. Shielding can be concentrated along the above powerplant or around the crew in th-

isulated between the two areas. Power distribution at the shielding material has a profound effect on the aircraft's overall performance capabilities and stability. It also regulates the radiation doses received by crew and structure.

If the shielding is all placed around the reactor, the crew radiation doses and structural radiation damage may be held to a negligible value. However, weight of such an installation becomes prohibitive when it is considered, at present, that the atomic-powered aircraft would not be an acceptable combat aircraft.

Shielding weight may be substantially reduced while still keeping the overall safe for a crew. By keeping half the shielding material around the crew and half around the reactor.

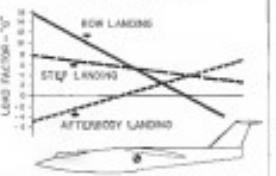
This approach has some serious problems associated with it, however, as about the most power per pound of reactor and consequently the lowest configuration. Heavy concentrations of weight at the nose of the plane would affect the crew compartment in a very unsafe and structurally and fatigued. Accelerations can be high at the nose of

the configuration. Fusing designers between high performance radiators and infrared operating lids on the front, and low performance and greater reliability on the after.

Natural radiation will damage aircraft materials much more rapidly than man-made. Lubricants, hydraulic oil, rubber leather plates and many electronic components are all highly susceptible.

In some cases a single substitution

★ NATIONAL ACADEMY OF SCIENCE RECOMMENDATION
EFFECTIVE LOAD FACTOR DUE TO VERTICAL & PITCHING ACCELERATIONS
WILL TYPE SEAPLANE



PROMISED Navy program for shielding an aircraft's nose in an atomic-powered aircraft with a radiation level that is possible using today's shielding materials. The purpose of decreasing doses of duty would be antiaircraft for high performance aircraft using the shielded cockpit.

al materials can replace the organic parts of present aircraft systems and not reduce their efficiency. This is not possible for all organic substances vital to aircraft operation and in these cases complete new systems must be developed to eliminate organic materials in additional shielding weight and should the cost.

Amount of radiation damage to any given component is a direct function of the distance and quantity of shielding between the component and the source. Therefore, any transfer of shielding from the reactor to the crew's compartment will have a great effect on the efficiency of organic materials which at security state remain the same.

Possible Configurations

Navy disclosed a year ago that small if approximately one-tenth the size of the PBM Seafarmer could be adapted for nuclear power. Subsequent tests of a torsion strength myth that the Navy will develop an aircraft somewhat like an *s*-airplane and planless to the *s*-airplane by a low power atomic engine delivering less thrust than the four *J*-71 turboprops in the prototype *s*-airplane.

There is little reason to use a high performance configuration similar to the Seafarmer if the top-speed of the atomic seaplane was to be considerably less than *s*-airplane. An obvious conclusion is that the aircraft's maximum power would be required to fly the atomic seaplane very high speeds for short periods. The maximum power could come from conventional turbines or reactors.

Retiring combination of almost infinite range and endurance with high speed capability could give the Navy aircraft wide capability from safe port to bombing targets far beyond the world. It might be a first line weapon and the

complete nuclear powered, high-performance aircraft was developed.

The task of engineering a workable atomic engine for aircraft is complicated by the fact that the power load requirements of aircraft are higher than those of other aircraft. The horsepower of the atomic seaplane is more than 120 and that of a conventional aircraft must approach 4. Light-weight shielding and engine components are therefore mandatory in aircraft.

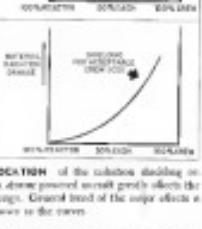
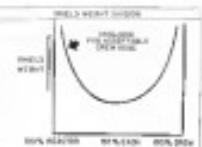
Atomic Heat

Current method of using atomic heat to power an aircraft is to pipe high temperature water from the reactor into a radiator in a modified turbine engine to replace the conventional burner. This was attempted unsuccessfully in Idaho Falls, Idaho, in January 1956, in Idaho Falls' experimental aircraft project. Keeping this network of hot pipes light and leakproof is a major problem.

Engines maintenance centers around the question of whether trouble-free static operation can be achieved. To make this possible, component reliability must be developed to a new high with all types of radiations. Leaks, burnouts etc., eliminated. If this is not possible, then the reactor must be easily replaceable with a minimum of supporting equipment so that the reactor could be replaced in a mobile base. Some of the problems associated with reactor removal are:

- Drilling a structure with a door to receive a large sheet.
- Heating a heavy object while running a continuous flow of coolant to that object.
- Disconnecting heat transfer lines and structural attachments while mounting cooling fins.

It is desirable that this could be done quickly as is without moving so that



The heat resistor would not damage the aircraft.

Starter shafting and stepping is also a problem because some reactors build up Nitron pressure, which must be transferred to other elements before the reactor can be started again. One tool conceivable here is and is not yet fully developed.

Development of an atomic aircraft was recently announced in under than 90% on engineering problems less than 10% research. One of the research problems remaining is to reduce the rate of heat element failure. Reducing thermal stresses and allowing for differential thermal expansion of the heat are described as the most difficult problems in this area.

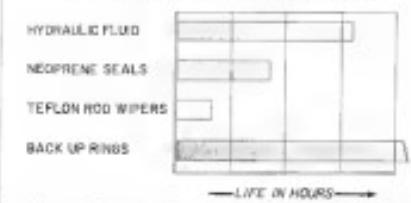
Crew Protection

The crew interior would be a divided-shielding, high-performance aircraft aircraft for 5 or 6 men out of a total flying career of possible 18 to 20 years.

The period in which aircraft will be updated is one that uses of days. Pilot's total duration airplane will not exceed 90 weapons/operational/week during his service. The safe limit is 100 RME if age 40.

This reduction in the amount of time

ESTIMATED LIFE OF WING FLAP COMPONENTS



RELATIVE EFFECT of vibration damage on conventional wing flap components is shown. This gives indication of the amount of protective assistance that would be necessary to keep the high performance aircraft seaplane's vulnerability rate at an acceptable level. Since these changes of materials will alleviate problems.



McDonnell F-101B Makes First Flight

McDonnell F-101B two-seat weather version of the supersonic F-101 made its first flight at Lockheed-St. Louis Municipal Airport. Powered by Pratt & Whitney J75 engines, F-101B is designed to achieve high rate of climb and to operate at extreme altitudes. Seated ejection is a radio option. McDonnell and additional USAF offices had been invited to F-101B, one of three variants of Voodoo series.



that each crew member will spend in the aircraft plus allows a higher case load rate to be used in the design. Lower shielding weight and higher performance are their possible.

Nuclear radiation has both immediate (within 30 days) and long range effects. There are five effects which are considered dangerous as an atomic aircraft:

- Degradation of performance.
- Breakdown of controls.
- Incidence of leukemia.
- Shortening of life span.
- Genetic mutations.

First three are immediate effects and require a definite threshold to occur. Radiation of the second response will be linear with dose, but the third level, shortening of life span, effects.

The last two items are the result of the total radiation absorption experienced over a lifetime. They can also be reduced to zero.

National Academy of Sciences and the Bureau of Standards recommended a maximum total absorption of exposure exactly 100 REM at age 40. If this level is observed the effect of radiation on shortening the atomic reactor's life will be less than for other weapons.

Predicted life spans of a child born at point A is 8 to 12 years less than the average.

New Dual Ignition Installed in J79s

Burbank, Calif.—New dual ignition system is being installed at Convair's engine plant, which powers Lockheed Aircraft Corp.'s supersonic F-104 Starfighter.

General Electric is handling the engine improvement program, which will replace approximately two-thirds

of the new ignition system. The installation of the new ignition system found a temporary interruption of F-104A flight operations at Palmdale. At once, an improved regimen can be installed in the Starfighter, the flight program will be accelerated to meet its previous schedule, according to Lockheed officials.

Last fall, GE acceptance test pilot R. C. Brown was killed while attempting a dramatic landing after the J79 boost jet during an F-104A acceptance test flight. Last week, another USAF pilot, E. C. Price, died out of 7300' altitude after experiencing a test flight. Early this month, R. W. Lutz successfully landed a Starfighter after blow-out of the Carter-Wright J65 engine used in the XF-104 Starfighter model.

All four flights occurred over the Antelope Valley test flight area.



VERTOL COMMERCIAL HELICOPTER demonstrated last week at Philadelphia with 15 passengers in cabin version. Two model 44 aircraft displayed have French markings (top left above). Cabin features standupeling, carry-on luggage rack, close-set bulkhead door.

Vertol Commercial H-21 Certificated

Philadelphia—Endress Vertol Model 44 commercial helicopter formerly known as Civil Aeromarine Advanced rotor type certificate has been awarded after public demonstration at Philadelphia International Airport. Model 44 is a version of the military H-21. Work done (AW April 1, p. 34).

Vertol is offering the conversion, an glorified biplane in three models for 10-passenger, 20-passenger, and 30-passenger. The 15-passenger configuration is \$300,000. Another version, designed for 10-passenger-cargo use, will cost \$277,000. As built, the 15-passenger version will be certificated separately for 10 hours with power dependent on the equipment.

Model 44 is manufactured at Internal Aircraft Corp. at the 148 15-passenger version. The units will be delivered to the French government for eventual military VIP transport use. Their design is elsewhere known and gold thread on the units bags drop pile carpeting on the floor.

Cabin is standupable for nose level comparable to current food-wing transports.

Model 44 features oval windows, rear-set main cabin door on left side, rear-on luggage rack plus rear cargo hold for checked baggage. Seats fold against the walls for fold or partial conversion to cargo configuration.

Cabin is 10 ft. 8 in. 3 ft. high, 5 ft. 6 in. wide. Second door at front of the cabin on the right side is used for hot cargo.

Model 44's useful load is 3,145 lb. It cruises at 100 mph., and range is 160 mi. with standard fuel service.

Vertol estimates the operating cost of the 15-passenger model at \$11,000 per seat-mile, with an 80% increase in revenue and based on 10-hour block operation.

At same block distance but with a 2,800-lb. revenue reduction, revenue cost will be slightly more than 100% costs Vertol claims.

Utility version, Model 44A, is designed to carry 15 passengers or cargo with a 6,000-lb. lift capacity.

Emergency version is Model 44C.

Empty weight of the basic aircraft is 8,655 lb. Emergency fuel tank gas, 16 Vertol's figures, would add 215 lb. to



FORWARD CARGO DOOR is feature of Model 44. Cabin accommodates 100 m. of cargo. 21 tons can be handled by an external cargo dolly. Delivery of new and export could start next year. Asking price will be about \$290,000.

Vertol 44 Specifications

PERFORMANCE

Maximum Speed (At Sea Level)	116 Mph
Cruising Speed	100 Mph
Minimum Rate of Climb (Sea Level)	3,000 Fpm
Effective Range (Standard Fuel Reserve)	360 Mi.
Fuel Consumption (Cruising)	75 Gals
Hovering Ceiling in Ground Effect	5,080 Ft.
Hovering Ceiling Out of Ground Effect	3,100 Ft.

SPECIFICATIONS

Gross Weight	
Normal	14,400 Lbs.
Military	15,000 Lbs.
Useful Load	
Normal	6,348 Lbs.
Military	6,705 Lbs.
Weight Empty (Standard Equipment)	
Normal	3,618 Lbs.
Military	3,693 Lbs.
Seating Capacity	
Crew	2
Passenger	15 to 39
Litter	22
Engines Ratings (Weight Cycles)	
Takoff at 2,700 Rpm. at 2,000 Fps.	1,415 Bhp
Normal (at 3,000 Rpm. at 3,000 Fps.)	1,275 Bhp
Maximum Cruise (at 2,400 to 2,500 Rpm.)	900 Bhp

the empty weight, while flotation load rating was world's old 115 lbs.

A 1,673-kw Wright engine powers the Model 44, and Vertol says the engine can be replaced with two turbines with only minor modifications. Present engine is equipped with two

spool superchargers that allow takeoff from 12,000 ft. elevation with 100% fuel for 160 cu.

Vertol 44 has flown more than 100,000 hrs., according to the manufacturer. This record helped earn Model 44 consideration here in recent months.

House Cuts CAA, CAB Requests

By Katherine Johnson

Washington—Funds for substantial increases in the activities of the Civil Aeronautics Administration and the Civil Aviation Commission Board during 1958 were approved by the House of Representatives last week despite persistent congressional drive that resulted in sharp cuts in the requests of the two agencies.

The fiscal year 1958 budget approved area:

- CAA \$125.5 million. This is \$32.9 million above CAA's fiscal 1957 appropriation but \$52.2 million less than requested.

- CAB \$44 million. This is \$23 million more than the Board's fiscal 1957 allocation but \$4 million below its request.

The increased budgets will permit CAA to hire approximately 1,350 additional technicians and reduce the increasing traffic on the federal airports and 221 air navigation facilities, plus 45 additional CAB employees.

On CAA's budget, the Appropriations Committee reported to the House:

Despite the vigorous demand for increases in financial appropriations, it appears to be an ultimate bid to provide additional funds for this agency. The measure of resources given in flight for the people of the nation must be the primary consideration. New and improved air navigation facilities which will result in the operation in 1958 must be properly planned if they are to be put into use. Further, sole quote proposed must be provided to handle the additional air traffic in the most possible basis. This is made in circumstances difficult due to the speed and range of the modern aircraft coming into use.

In its speech on the House floor, Rep. Francis X. Murphy (D, Ga.), chairman of the Committee on Appropriations, called for an increase rather than a portion of the increasing service cost. "The time has come where consumer and producer must pay a fair charge for

the services he desires. The cost is terrific. It is going to be in, waste and waste everywhere," said Murphy and urged that greater efforts should be made to compensate for some of this expense that the taxpayer is having to bear." Military aviation responsible for 95% use of the services, he added, should render funds to CAA for necessary support.

Congressional Pay

The Appropriations Committee urged the CAA to study the compensation of aircraft personnel and said it is recommended that whether or not an independent undersecretary who has direct control over and responsibility for the safety of aircraft at airports and in flight are having paid adequate salaries to assure maximum competence.

Of the 48 new CAB employees, 15 were allocated to expand services on the Board's backlog of 700 route cases, 25 for training activities, sixes for studies of airline rates and use to aid Board decisions. Additional funding was needed, however, to enable the CAB to cope with the fast-accelerating and the boldest liaison with the large airline companies.

CAA Budget

Detailed of CAA's budget are:

- Operation and maintenance, \$177.7 million. This is \$6.9 million above the fiscal 1957 allocation, but \$17.2 million below CAA's request.

- Establishment of air navigation facilities, \$116.5 million, an increase of \$4.3 million over the current year but \$5.4 million below CAA's request. The Appropriations Committee also recommended that the Defense Department transfer \$7.7 million to CAA to finance the "smooth" portion of the VOR system, since transfers would fill the gap.

- Airport construction, \$93 million. A \$1 million reduction was made in CAA's request because, the House Appropriations Committee said, Secretary of Commerce Stanley Watzke believes that airport appropriations "have had too high a priority."

- Air navigation developments, \$1.5 million. This is the same allocation made for the current year but \$100,000 below the request.

CAB Appropriations

- The two categories of CAB's appropriations are:

- Administration, \$5.2 million.



Painting by Edward Alphonse Borel, Jr. (b. 1924). Copyright © 1958 by Edward Alphonse Borel, Jr. Charles Stewart, publisher, by Harry F. Nester.

Space... Time... and Temperature ...with Fenwal aboard

Space and time accommodate no man. But temperature is a little easier abiding.

Space ships probably will have micro-electric blinds that open automatically on the part of the cabin respond to sun rays and close on the dark side. What about small electronic components and instruments? That's where the advanced work of Fenwal has been doing its modern aircraft and missiles. Not only have the temperature sensing problems themselves been solved practically

and reliably—but the factors of conformal good service under shock, vibration and extreme climate conditions are being met also.

A good example is Fenwal's leadership in differential thermometers, controls for various compartments, cooling effect detection, heating over-heat



Controls Temperature... Precisely

Manufacturers Push to Meet Jet Deadlines

Aviation Week surveys progress, design changes being made in U. S. commercial turbine transports.

Los Angeles—U. S. turbine transport manufacturers are pouring man and money into meeting deadlines for first flight certification of jet-powered aircrafts of both propfan and turboprop origins. An *Aviation Week* series of profiles from them for that:

- ♦ Douglas has completed 95% of DC-8 engineeing, with close to 100% done on the airplane. Passages 610 have been delivered. 819 drawings of the plane and the system. Tooling is still advanced, as is the subcontractor program. New manufacturing facilities at Long Beach for DC-8 final assembly are 95% finished, with some of the 10,075,980 sq ft already in operation. First flight date is now March, 1970.

- ♦ Lockheed, with engine difficulties, has virtually completed engineering on its Electra turboprop transport, has 75% of its tooling built, is well into the fabrication of the first airplane, has parts of the second in the works and has more than 50% of the necessary basic research completed.

- ♦ Convair engineering has reached drawing release stage for the 880 turboprop transport, has 75% of its tooling built, the overall's life cycle cost and field tooling in early construction, lead under parts being located, and production assembly is scheduled to begin soon.

- ♦ Fairchild, with operations moved to production of an already designed and certified aircraft, has 60% of its tooling done for the C-27 Propfan Transport, its fabrication under way on the first airplane and carbons and wings.

- ♦ Boeing has completed engineering on its 707 turboprop transport except for engine. Tooling is completed for the 707-170 and 210, and is well along for the larger 120. A ground test model. Evaluation of the first aircraft is well under way, and parts of the second are being delivered for evaluation. Some flight testing has been accomplished with the 707 prototype, especially in systems and automatic flight controls.

Start of the turbine transport programs marked the entry of two engine manufacturers, Allison and GEnx Electric, into the commercial field. Both are going the turbine builder route

route beginning on this page on the program of U. S. aircraft manufacturers toward the production of their respective turbine-powered transports via galliard and preprint by Richard Swanson and Irving Stone of Aviation Week's Los Angeles bureau.

turbine support in developmental and operational testing programs. Pratt & Whitney already is well established with major orders on hand for customer test versions of the JT37 and JT3 powerplants for Douglas DC-8s and Boeing 707s.

Allison already has supplied two Lockheed Electric power packages in its newest Convair Lancer transport. Perhaps a greatest reward to take the Electra module along with the 301-211 turboprop engine and Aeroproducts 600 propeller.

Lockheed begins test flights March 1 on its Electra module installed in the right outboard position of its first test bed, Convair 880 No. 1081. In addition, the company will have Super C Convair flying each in job with four Electra power packages.

Although the Allison 301-B13 is a commercial J adaptation of the military T-40 turboprop, Lockheed C-27's modern technology transport will have some unique source before the first Electra deliveries the additional flight test program has been established in order to have more than 500/600 flight hours on the engine by the time

it enters commercial service.

Supporting Convair's extensive ground testing is now in progress at General Electric's Everett plant, where the 170 Convair gliders similar to that at San Diego Municipal, Convair and General Electric are going an increasing flight exposure with the JT9 in Convair's USAF B-58 supersonic bomber and the CJ-2 in a naturally the same power plant plane elsewhere.

Independently, General Electric is conducting extensive flight tests with the JT9 in the F-104, F-105 and F4D at Edwards AFB, Calif.

Starter module test jobs have been under way at Boeing and Douglas.

The Douglas plane contractor drag rated the engine for the job to be tested first version of the DC-8. This is a patient sales factor in that such a program would be unattractive to customers who would be worried about a lower aircraft environment as sprays, burning and equipment wear to occur.

Pontiacs considered for use in the DC-8 include the Pratt & Whitney JT8D-3 or a Novo development scheduled to go as the AHD-3-Causal Electric's CJ-801 and seven foreign engines.

Many industry observers, however, feel that the DC-8 will not progress beyond the design study stage. Thus to day, several sets of specifications for the DC-8 are in existence and power plants for the desired thrust/weight ratio are needed.

Boeing also has chosen the favored advantage of plurimotor, single, or dualjet, transports for medium and short-haul route segments.

Boeing has proposed two medium



Other techniques used under conditions of approximately ten-millionths of atmospheric pressure.

birth of a superalloy

Vacuum melted alloys, as developed by the Utica Metals Division of Kelsey-Hayes, provide extreme cleanliness, maximum chemical stability. They are superalloys, developed to withstand stresses and temperatures generated at supersonic speeds.

The Utica Metals Division expands still further Kelsey-Hayes' capabilities in the manufacture of expendable metal products for industry. Kelsey-Hayes Co., General offices: Detroit 32, Michigan.

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NEW DRAWINGS of Lockheed Electric turboprop aircraft show slope to confess with Allison engine/Aeroproducts propeller combination, now flying on Super Convair.

short-haul jet transports. The 717 and 727. The 717 will have the greatest load capacity, the 727 being well beyond its gross weight limit. Both will have a longer range, though. Both are at the design study stage and, like the DC-9, probably will not be built. Postponements such as the 717, 727, and possibly the British Olympus, are still being investigated.

Douglas

To benefit its DC-8, Douglas has constructed two new buildings at its Long Beach plant. Engineering work completed except for exterior, is well along at Santa Monica, where other transports are built and all aerospace engineering is accomplished. Fabrication of the first aircraft is now way, way ahead of schedule. It was due to arrive at the end of December, but is now due January 10. The second aircraft will be built on DC-8 stage schedules at the new Long Beach facility.

Parts for the DC-8s are being fabricated at recent Douglas-Searle Calif. plants and fed into assembly at Long Beach.

Sixty-four parts have started to arrive at Long Beach. Major subcontractors are: Rock, power, avionics, Cleveland Engineered Tool Co., landing gear, and American Seating Co., which is doing some machining work. Purchases for the first aircraft plant are 99% complete; airframe and interior sections 97% done and fixtures where customer requirements dictate progress on this last section of the aircraft, to be completed by 60% finished.

The new Long Beach facilities include a structure fabrication building, where intercontinentals are built, and the first aircraft building for the aircraft, which is physically the same size for both domestic and intercontinental models, but with differing powerplants, gross weights and performance.

DC-8 Orders

Douglas now holds 100 firm orders for the DC-8 in both configuration categories, another of airframes, type and engines specified:

- + Pan American, 21 intercontinentals with the Pratt & Whitney JT8
- + United Air Lines, 10 domestic, 12 with the 175, 18 with the 717, a ratio which may change soon.

- + National Air Lines, six domestic with 715
- + Eastern Air Lines, 28 domestic with 715
- + Delta, eight domestic, six with the 175, two with the 717
- + Panair, four intercontinentals 715

- + Trans-Canada Air Lines, five order commitments with Rolls-Royce Conway
- + KLM, eight intercontinentals with 715
- + Japan Air Lines, four intercontinentals with 715
- + Scandinavian Airlines System, seven intercontinentals with 715
- + Swissair, four intercontinentals with 715
- + UAT French airline, three intercontinentals with 715
- + An unannounced order for three intercontinentals with 715.

Specification Change

Douglas has issued a new set of specifications for the DC-8 covering two changes in gross weight allowances and fuel performance allowances due to passenger changes.

Planned characteristic changes from earlier specifications (AW Feb. 20, 1976, p. 135) are an increase in fuselage length from 145 ft. 10 in. to 146 ft. 6 in., and a reduction in the air cargo compartment volume from 1,445 cu. ft. to 1,415 ft. 6 in.

In parentheses the Pratt & Whitney

175-powered engine formerly specified for DC-8 is the JT8D-4, which has been changed to the JT8D-6 with some performance gains. Engines changed. There also have been changes in the Pratt & Whitney JT8D-3, the one currently in production. The JT8D-3 has no fuel performance improvements changes. This same holds true for the Rolls-Royce Conway engine.

For the 175-powered domestic, four class options change:

- + Maximum takeoff weight is raised to 261,490 lb. from 259,600 lb.
- + Manufacturer's weight empty, to 511,000 lb. from 504,880 lb.
- + Operating weight empty, to 121,034 lb. from 112,226 lb.
- + Capacity payload, static loaded, to 13,470 lb. from 13,290 lb.

+ Number of passengers, to 138 from 125

+ Range, static max, to 3,944 from 3,856

+ Cost per airplane mile, to \$1.18 per statute mile from \$1.34

+ Cost per seat mile, to 1.55 cents from 1.76 cents

+ CAA field length required for takeoff, minimum takeoff wt. to 9,389 ft. from 9,445 ft.

+ Range with 6,500 lb. CAA takeoff field length, to 2,043 statute mi. from 1,830 statute mi.

Tourist Changes

In the tourist version capacity per seat static loaded, changes are:

+ Range, to 3,083 statute mi. from 3,576

+ Cost per seat mile to 1.09 cents from 1.17 cents

+ Level flight maximum cruise fuel cost \$10,800 ft. at 270,000 lbs., to 598

ft. field length, to 1,700 statute mi. from 1,776

for the 175 domestic first class or plane, change to:

+ Capacity payload, static loaded, to 13,630 lb. from 13,225 lb.

+ Number of passengers, to 138 from 122

+ Range, to 4,000 statute mi. from 3,918

+ Cost per airplane mile, to 1.17 per statute mile from \$1.73

+ Cost per seat mile, to 1.48 cents from 1.41 cents

+ CAA field length required for takeoff, minimum takeoff weight, to 7,180 ft. from 5,840 ft.

+ Range with 6,500 lb. CAA takeoff field length, to 3,077 statute mi. from 2,815 ft.

For the domestic 175 tourist version, only changes are in capacity payload static loaded, cost per seat mile, which is now 1,737 cents as compared with 1,776 cents for the earlier specification and range with 6,500 lb. CAA takeoff field length is now 3,578 statute mi. as compared with 3,595 on former specifications.

International Changes

For the 175 powered first-class intercontinental airplane, changes are:

+ Range under capacity payload static loaded, to 1,040 statute miles from 947

+ Cost per seat mile, under capacity payload static loaded, to 1.17 per airplane mile from \$1.63

+ Cost per seat mile capacity payload static loaded, to 1.50 cents from 1.46 cents

+ Range with 6,500 lb. CAA takeoff field length, to 5,070 statute mi. from 3,066

Tommy reason, 175 intercontinental changes are as follows: in capacity payload static loaded range, static loaded, now 3,460 statute mi. from 3,430 statute mi., a cost per seat mile increase under capacity payload static loaded, minimum range, static max, to 3,944 from 3,856

+ Cost per airplane mile, to \$1.18 per statute mile from \$1.34

+ Cost per seat mile, to 1.55 cents from 1.76 cents

+ CAA field length required for takeoff, minimum takeoff wt. to 9,389 ft. from 9,445 ft.

+ Range with 6,500 lb. CAA takeoff field length, to 2,043 statute mi. from 1,830 statute mi.

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+ Cost per seat mile, to 1.48 cents from 1.41 cents

+ CAA field length required for takeoff, minimum takeoff weight, to 7,180 ft. from 5,840 ft.

+ Range with 6,500 lb. CAA takeoff field length, to 3,077 statute mi. from 2,815 ft.

For the tourist 175, international changes are:

+ Range under capacity payload static loaded, to 1,040 statute miles from 947

+ Cost per seat mile, under capacity payload static loaded, to 1.17 per airplane mile from \$1.63

+ Cost per seat mile capacity payload static loaded, minimum range, static max, to 3,944 from 3,856

+ Cost per airplane mile, to \$1.18 per statute mile from \$1.34

+ Cost per seat mile, to 1.55 cents from 1.76 cents

+ Level flight maximum cruise fuel cost \$10,800 ft. at 270,000 lbs., to 598

ft. field length, to 1,700 statute mi. from 1,776

for the 175 from 582, static TAS +CAA field length required for takeoff, minimum takeoff weight, to 8,370 ft. from 8,000 ft.

+ Range with 6,500 lb. CAA takeoff field length to 3,070 statute mi. from 2,815 ft.

For the tourist 175, international changes are:

+ Range under capacity payload static loaded, to 1,040 statute miles from 947

+ Cost per seat mile, under capacity payload static loaded, to 1.17 per airplane mile from \$1.63

+ Range with 6,500 lb. CAA takeoff field length to 3,077 statute mi. from 2,815 ft.

For the domestic 175, international changes are:

+ Range under capacity payload static loaded, to 1,040 statute miles from 947

+ Cost per seat mile, under capacity payload static loaded, to 1.17 per airplane mile from \$1.63

+ Range with 6,500 lb. CAA takeoff field length to 3,077 statute mi. from 2,815 ft.

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+ Cost per seat mile, under capacity payload static loaded, to 1.17 per airplane mile from \$1.63

+ Range with 6,500 lb. CAA takeoff field length to 3,077 statute mi. from 2,815 ft.

Without refueling at every stop, a 9,516 ft.

Airline manufacturers to be introduced on the Electra include:

+ "Living room" interior, in which passenger seating is arranged around tables with individual and table lamps, arranged so a table can be to a living room. Higher windows in the cabin provide a view of the interior of the plane.

+ Range with 6,500 lb. CAA takeoff field length to 3,070 statute mi. from 2,815 ft.

Lockheed

Lockheed is well along toward meeting its Electra first flight date next Jan. 11.

Basic structural engineering is 100% released to production and tooling, basic fairing design is 99% completed with release expected by the end of the month.

Lockheed has completed hot propane and nitrogen, wind tunnel and fire system tests and is ready for final aircraft environmental testing. Lockheed is planning to go with higher initial transport speeds.

A new luggage handling system was the first manufacturing item to help reduce delivery leadtime to 10 months. Still to come are swing-wing contributions to go with higher initial transport speeds.

The Electra will use a multifunction display system developed by the Advanced Displays of Garrett Corp. The avionics package comprised of 100 items for starting up engine then flight deck is scheduled for Aug. 1, initial flight is set for Dec. 1, first flight for Dec. 20.

With the first flight date set, ground handling and equipment Lockheed has developed a specialized unit for the wheel set to ease swinging conditions when loading. Power is applied and rotates it to an normal controlled position when moving aircraft.

The Electra will need auxiliary power units of greater output than those used for today's aircraft.

The customer service Lockheed is studying has initiated a spare parts program attached to each Electra and will include parts for engine and structure, and will also produce the hardware to make that adequate spares are always available.

Announced Electra backlog is 173 airplanes with 524 rolling with spares. First article delivery will be in October in 1975, the first of 40 ordered. Other airlines' first sales and first delivery dates are: April, 1975, Braniff; June, 1975, Pan Am; April, 1976, Pan American; April, 1977, TWA; April, 1978, Pan American; April, 1979, Pan American; April, 1980, Pan American; April, 1981, Pan American; April, 1982, Pan American; April, 1983, Pan American; April, 1984, Pan American; April, 1985, Pan American; April, 1986, Pan American; April, 1987, Pan American; April, 1988, Pan American; April, 1989, Pan American; April, 1990, Pan American; April, 1991, Pan American; April, 1992, Pan American; April, 1993, Pan American; April, 1994, Pan American; April, 1995, Pan American; April, 1996, Pan American; April, 1997, Pan American; April, 1998, Pan American; April, 1999, Pan American; April, 2000, Pan American; April, 2001, Pan American; April, 2002, Pan American; April, 2003, Pan American; April, 2004, Pan American; April, 2005, Pan American; April, 2006, Pan American; April, 2007, Pan American; April, 2008, Pan American; April, 2009, Pan American; 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Navy's B7E transports and 440 passengers provided transport producers. Two aircraft will under seating capacity initially to 300 at sitting and fuselage 300 are planned.

* **Fuselage bows and auxiliary tables** for structural elements are scheduled for construction between June of this year and next month and August, while using bulkheads and fuselage 300 bows will be fabricated and started through November. Plot bows and forward fuselage section are scheduled for assembly in January, 1958, four major wing sections in February, 1958.

* **Bulkheads and structural elements** are being used to reduce wing weight. This covers large areas of the airframe-type structure, a seat at Cessna's 800 and 1,000 seats, and will be used to demonstrate more efficient layout, use of materials and survival features for deflection and extrapolation, planning and structural attack points.

Airline time between outbreaks on the CJ 853 is expected to reach 8,500 hr in the first five years of utilization.

Variable quickly to the mixed version or all-couch version.

A large cockpit has been styled by Harley Earl, Inc. and developed by Dorothy Draper Associates in initial presentation for Cessna and customer review.

* **Cosmopolitan Electric program** is sound approach and threat overall for the CJ 851, commercial version of the GE 750-179 turboprop engine has been followed closely by Cessna engineers. Considerable advances have been made, they report, in which specified requirements.

* **Cessna engine mockery** of the CJ 851, methods developed for the airframe-type structure, a seat at Cessna's 800 and 1,000 seats, and will be used to demonstrate more efficient layout, use of materials and survival features for deflection and extrapolation, planning and structural attack points.

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Weight Factors

Minimum take weight of the Cosmopolitan 850 is 18,000 lb, maximum takeoff weight 175,500 lb. Maximum landing weight is 160,000 lb, minimum landing weight 117,000 lb with change of altitude and load. Minimum landing weight is 117,000 lb. Seat price, load limit for the standard 84-passenger version 72,360 lb. 7,000 lb for passengers, 3,180 lb for luggage—48 per passenger, 51,407 lb for luggage—48 per passenger, 51,407 lb for luggage—48 per passenger. For a trip length of 1,200 mi, Mack quoted a 71% trip and average speed of 0.75 mph under zero wind conditions.

Already complete is the ballasting of the cabin interior, completion written prior to the start roundup.

Soleilwind seems a solid shoulder check on the thermal capacity of the aircraft heating system and insulation, bracing section, 23% in long circumferential span along skin, strength windows, airframe and thermal insulation and representative fastenings already are complete and they are waiting for the cold chamber test.

* **Cockpits for TWA and Delta** have been worked up in all details and anticipated by both contractors with significant success.

* **Base clearing of pilot and captain availability** is based upon a schedule used on Cessna's F-102 refresher. It took a jet of hot blood and across the entire availability base. In addition, switchboards are electrically tied red and cutaway.

* **First new seats in cockpit are Cosmopolitan**, adaptable for left as well as for long-haul and up-and-down positions. Seats are cushioned for body comfort for long extended periods of operation. Prototype seats built by Webster Aircraft Corp. are now installed in the cockpit.

Airline West, Inc., learned that TWA may specify these seats for its aircraft in the midpoints of the Boeing 707's life period.

* **Mockup of cabin interior** is expected to be complete in all respects by late September. Standard 84-passenger seats by June 1. This standard version will be com-

pleted quickly to the mixed version or the all-couch version.

Alternate Seat Plans

Alternate seat arrangements include first class, first class with divider, 84 seats, coach, 114 seats, coach with forward lavatory, 112 seats, coach with forward lavatory and toilet, 89 seats. Four mixed-classes versions vary from configurations of 24 standard and 74 coach seats to 36 standard and 34 coach seats.

Cessna reports another arrangement in which the entire plane is laid out as a compartmentalized cabin/cargo style, totaling up to 90 passengers.

Block costs calculated by Cessna as follows: cost of the type certificate is \$80,000; New York-Los Angeles, 2,468 miles, four hr, 41 tons; Chicago-Minneapolis, 347 mi, 40 min; Chicago-New York, 759 mi, over hr, 12 tons, Dallas-Los Angeles, 2,737 mi, three hr, 15 tons, New York-Shawnee, 1,074 mi, over hr, 29 tons; Miami-Panama, 1,526 mi, over hr, 15 tons; Miami-New York, 1,098 mi, two hr, nine tons.

At 117,000 lb, landing weight, with no passengers in the payload of 22,360 lb, the 850 can land at most 100 ft above ground level. At a range of 1,200 mi, a block speed of 400 mph, and a fuel consumption of 112 mpg under zero wind conditions, 850 can be取得, according to Cessna calculations. For a trip length of 1,200 mi, Mack quoted a 71% trip and average speed of 0.75 mph under zero wind conditions.

Runway Needs

Considering range as limited by runway length, a 3,500 ft runway will be adequate for landing and taking off to operate at range up to 3,840 mi with the CJ 851. The all-new engines, the subcritical engine-CJ 851-100, provide a range of 3,840 mi with the same runway length under standard conditions at sea level, calculations show. Unfortunately is that the CJ 851 is two percent distance to be stretched to 3,800 mi.

Particular aspects of payload, Cosmopolitan can be created in a range of 1,760 mi, from 3,460 mi, and a minimum weight payload of 3,380 mi, without restriction by maximum seat count, aircraft gross and running weight. For this reason, a 3,460 mi range is the minimum range of the aircraft under standard conditions, although it is not the maximum range available in the cockpit. 47,110 lb is allowed, for three seats, aircraft 464 cu ft is allowed, with 365 lb for the airframe.

Various combinations of four and five-seat seating is possible with a quick-change modular feature. Component dividers, with additional seat storage, can be placed in five positions

AVIATION WEEK April 15, 1958

per engine hour for the first two hours of operation, then:

* **Block operating cost per seat mile** is 8.85 per cent, first class is 2.7 cents for a 300 mi range, 1.75 cents for 500 mi, 1.43 cents for 300 mi, 1.37 cents for 1,000 mi and 1.1 cents for 1,500 mi where the case begins to flatten out.

* **Block operating cost per seat-mile** is 1.15 cents for 300 mi, 1.25 cents for 500 mi, 1.21 cents for 1,000 mi, 1.18 for 1,500 mi.

* **Block operating cost per airplane mile** is \$1.91 for 300 mi, \$1.58 for 500 mi, \$1.41 for 1,000 mi, \$1.10 for 1,500 mi and \$1.12 for 1,500 mi.

Boeing

The first production model of Boeing's 707-120 is now being assembled and will be rolled out at Everett with the first flight scheduled for December. The aircraft scheduled to go to Pan American World Airways will first be used for Boeing flight test work. It will enter its Civil Airlines Air Maintenance type certification flight test program in the spring. By the time the 707 production model begins its type certification all aircraft will be in the Civil Airlines Air Maintenance type certification flight test series of a Latin American flight control center. A production model of this aircraft is being used and improved. Home research and development flights will be as flight test on the present prototype, as flying this week to be accomplished without slowing down the certification program.

Boeing has scheduled starting of final and functional tail surface location and are in assembly at the St. Louis, Mo., plant of Boeing Aircraft Company's wholly-owned subsidiary, Douglas Aircraft Company. Mid-plane wings have started and tailcone constructed to accommodate the F-27 production line.

It also is reported planned that the prototype 707 will be used by Boeing, the GAA and subfirms for air traffic control research and development work along with other 707 programs.

Precision Propulsion

Boeing is offering several planes in the physical plant with various power plants. The 707-120, 220 and 320 are the small aircraft equipped with 157,773 and Cessna 337 engines respectively. The 707-320, 337, 347, 357 and 367 aircraft are powered by Pratt & Whitney R-4360 engines. The 707 and Cessna aircrafts are not yet completed for the 707-320, 337 and 347, and trials complete for the 707-357 and 367, trials complete for the 707-220 and 320, trials complete for the 707-120 and 337.

New specifications call for increases in the Boeing 707-320 capacity from 80 first-class passengers to 124, and from 730 to 770 at the tourist configuration. Minimum gross weight was increased from 210,000 lb to 240,000 lb.

Customer for 140 jet seats wants 5618 inches, including space number of places needed and size of first division. * **For American**, 120s and 17-320s due in December, 1958, and August, 1959, respectively.

* **American Airlines**, 93 707-120s, February, 1959.

* **Sabena**, four 320s, December, 1959.

* **Air France**, 17-320s, November, 1959.

* **Aeroflot**, three 420s, January, 1960.

* **British Overseas Airways Corp.**, 15-420s, December, 1959.

* **Swissair**, 22-320s, October, 1959.

* **Continental**, four 120s, May, 1959.

* **Lufthansa**, four 320s, December, 1960.

* **Qantas**, three 120s, May, 1959.

* **TWA**, nine 320s and 12-320s, due April and November, 1959, respectively.

Fairchild

Fairchild plans staff for production only on the Fokker F-27 Flyingboat, powered by four Rolls-Royce Dart engines rated at 1,600 rpm. Type certification and flight test of the 26-passenger plane will be accomplished at the Fokker factory in Holland with U.S. GAA officials in attendance.

Testing for production of the aircraft for which Fairchild has 67 firm orders from local service airlines and corporations is 100% complete. The company will take delivery of the first aircraft from foreign customers who will proceed to certification.

Although no firm wing planform, tail and horizontal tail surface location and are in assembly at the St. Louis, Mo., plant of Boeing Aircraft Company's wholly-owned subsidiary, Douglas Aircraft Company. Mid-plane wings have started and tailcone constructed to accommodate the F-27 production line.

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* **Loewy-Bethel Overseas Airlines** Corp. will start aircraft training this June with two modified de Havilland Comet II. The airline is scheduled to take delivery of six Convair 440s later this year.

The modified Comet II will each have 32-20A seats arranged in the set board printing with less powerful Avro instead.

BEA Starts Comet Training in June

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Capital President Says Viscount Slandered by Competing Airlines

By James Shuler

New York—Capital Airlines' Viscount fleet seems subject to "various and continual attacks" by competing airlines, Capital President J. H. Cramm said.

Since the last word of the Viscount was in July of 1955, Cramm claims, no opposition has been put to the most vicious and unreferenced attacks on a continuing basis concentrated on planes just the size of the Viscounts. He thought world's most honest thought would do the most harm. I was thoroughly shocked and disturbed by those attacks when I first learned of them and I still am.

I want to say here and now that another Capital not Viscount will over time measure up to this type of press given and given against us. We'll never neglect such matched tactics.

Cramm said of the competition, "when he did not want us to live as to how to pilot divide the Viscount to their passengers were their airplane's public address systems."

He quoted one pilot as telling the passengers:

"Look sharply now and you'll see it fly past the Viscounts. If you want dependable service, then clear of Viscounts."

Viscount Defended

Cramm added of the attack during a luncheon at the Society of Automotive Engineers' National Aerospace Meeting that made a defense of the plane "imperative," manufactured by Vickers Armstrongs, Ltd.

Capital runs 60 of the medium range 44-passenger airplanes in operation and 15 more on order. Cramm said, featuring new low fares arranged for the 15 and delivery is scheduled to start soon.

The company lost \$2.8 million last year, but Cramm said the Viscounts equated at a profit.

"The Viscount earned Capital a year of insurance," he said. "That amount is a good argument and we're not going to underplay it. We've got the DC-8, the DC-9 and Constellations and we didn't make a profit on our engines but the Viscount did."

Timothy was one of the major enemies facing the Viscount in operation. Cramm said the transmission pins that the Viscount staff was less complicated and required less time than that into the DC-8 and Constellations.

"That's another feature that people don't realize," Cramm said. "Our planes moving into the Viscount re-

quired planes to move up into other airports."

Although the then smaller Viscounts had 365 freight passengers, 615 of them Viscounts. Personnel travel for maintenance reached 805.

Cramm said the Viscount program wasn't particularly difficult, that the technology is a relatively simple power production system and the major thing the pilots had to learn and accomplish understand was its fuel economy.

Viscount Problems

Numbers of pilots to the Viscount have been favorable, Cramm said, "I think we'll never know anything like better." The engine is untried and there are some modifications. The engine deck is much smaller than DC-8 and there are no way to check them out to see if they're all right."

The engine problem admitted that the Viscount had its problems. It was found that the cabin pressurization system was inadequate; it wouldn't cool sufficiently as the ground air pressure was lost in the winter. Justified on continuing flight the problem.

Bruke troubles were Capital's own fault, he said. The original design was switched to copper to save weight, but the copper heated up and the seal was removed.

Reasons of the BEA Viscount crash in England resulted in Capital's Viscounts being withdrawn from service to replace the older Viscount jets. Capital said there was no school grounding and the program was completed in 72 hours.

And despite the reasons, Cramm said, "we have had no trouble with our landing gear. It's not the fault of the airplane when the pilot fails with the landing gear retracted."

Spar Criticism

Cramm said criticism of the Viscount has centered on its single spar construction, that it was a very slender airplane and had insufficient safety.

Defending the single spar, Cramm said there's a lot of theory on seat construction and no one has yet proved anything wrong with it.

"I think that the competition's attacks in this area fall off when critics were found in his own airplane's own pits."

Cramm blamed some of the Viscount's weather flying problems last winter on the high minimum weather requirements voluntarily imposed on

all planes newly checked out in the air craft. This consisted of a 100 hr. of experience in the aircraft the pilot was assigned to.

Airline brother with the opponent could not agree. Cramm said, "When you have 1,900 pilots operating under high minimum weather conditions, you're going to spend a lot of time on the ground, and as we know last winter was one of the worst we've experienced. But says we've got one winter of flying under our belt. Watch us next year. We'll have the Big Four implants looking down on us again all winter."

Cramm said the Viscount was the best possible airplane for Capital, whose longest route is 1,000 m.

"We don't contend that at the heat altitude we're as fast in the DC-8, but give to give we're better because we're easier to operate and more maneuverable."

In Europe, he said, BEA is flying Viscounts daily on routes 1,000 mi. or better, but there is no such justification to do it in the U.S.

"We found the shell wings is 600 mi. and we can do 750 mi. very much. We didn't have them to operate any longer than that. We'd put in non-stop flight at Pittsburgh and return down to Fort Worth in a stock New York."

Cramm added all a friend who complained of being forced to exchange his ticket from Capital to another airline for a Washington to Chicago flight because the Capital airplane wouldn't fit in the prevailing weather.

"We found 44 passengers were on the opposite side of the plane flight. Our audience said, 'read we were so glad be able to take them.' Me friend took off, flew over Chicago for two hours and then landed at Tulsa."

TWA Cuts Are Begun As Burgess Promised

New York—Stamps made out in Trans World Airlines personnel have begun under a right-sizing up program initiated by Carter L. Burgess, the airline's new president. Burgess told Aviation Week that he expects to 10% of TWA's personnel through the internal reorganization to bring about a more balanced work strength (AW Feb. 4, p. 1).

Right-sizing so far have amounted to less than half of that percentage. Aviation Week learned between 500 and 1,000 employees will be affected during a period which began last last month and will be in the middle of this month. TWA's personnel total is about 22,000.

Cuts have been mostly in TWA's "long-haul" units. Little or no decrease in operations or maintenance

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GENERAL ELECTRIC

personnel has been made as planned. The airline is expanding delivery of new equipment, and the upgrading program will continue until all cell for sonic expansion of operating work force.

Sixty-four locations within the airline are excluded in the basekeeping rate gas, which has let the heart of the cuts. For example, PVA's substantial military division department, which formerly consisted of the Atlantic, Central and Western regions, has been pruned to two units, with the Central region eliminated.

Any further cuts can suddenly begin after the peak season.

SHORTLINES

► **Middle East Airlines**, an affiliate of British Overseas Airways Corp., will inaugurate four new services and increase flight frequencies on three established routes in the course of its summer flight schedule. The new routes—Beirut-Rome-London, Beirut-Vienna, Beirut-Tunis, Beirut-Bahrain-Doha, Beirut-Cairo, Beirut-Atlanta-Zurich, Beirut-Moscow, Beirut-Paris and Beirut-Khartoum will be increased from three to five; the Beirut-Baghdad/Tehran flights from one to two.

► **United Air Lines** and Quantair have signed an interim agreement permitting each carrier to issue a single ticket or switch its passengers or cargo to the other service. United now has a total of 164 airline agreements.

► **International Civil Aviation Organization** has headquartered in North America and Caribbean regional office leave Montreal to Mexico City in order to get the office closer to the states it serves. The region covers Canada, the U.S., Mexico, the Dominican Republic, El Salvador, Costa Rica, Guatemala, Honduras and Nicaragua.

► **Swissair** will begin non-stop flights from New York to Lisbon on May 4. The surface of offer over night is a weekly DC-3C non-stop flight which continues via the Congo river to Zaire. Swisair will be the first European carrier to offer service between the U.S. and Lisbon. The service will be part of Swissair's summer schedule, which also features non-stop flights from New York to Copenhagen and Stockholm, and cities around the Scandinavian and British Isles.

► **United Air Lines** has added special service for babies on all flights with a choice of front entries, first class, coach, executive and soft.

AIRLINE OBSERVER

► **Civil Aviation Board** is finalizing a schedule for year-end franchise, franchise and franchise operations for the first time as of January. Initial estimates for 1958 are confined to \$2.5 million for 15 local service carriers, \$4 million for three helicopter carriers, \$6 million for eight carriers serving Alaska, \$11.5 million for two airlines operating within Hawaii and \$1.7 million for Pan American Latin American services. Pan American's previous annual estimate of \$7.5 million for 1957 has been cut to \$1.5 million, and the subsidy amount of \$5.5 million originally estimated for 1958 has been eliminated.

► **Air Transport Area** has warned that "bona fide" routes are needed to publicize and build up a base, as well as actual attempts at destruction of an aircraft would bring in Federal law enforcement agencies. Last in a series of code notes was issued by Southern Airways.

► **Majority of air route traffic control centers and towers are now operating on at least a 60-hour week because of the shortage of trained controllers.** Civil Aviation Board reports, in some instances, controllers are working 60 to 72 days without a day off.

► **Tour-Canada** An Early bird reservation on its Canadian routes when there are no competing airfares. The carrier also works to retain its monopoly on transcontinental Canadian routes and services its routes to the U.S. with routes from Montreal to Boston, Winnipeg to Minneapolis and Vancouver to San Francisco.

► **International Civil Aviation Organization** is calling for an improvement in air traffic control and navigation facilities in Central and South America. The group has blamed the deficiency—the large gap in the world-wide system of flight information—and attributed lack of sufficient financial resources to government failure in the chief cause of the problem.

► **Air Traffic Control Area** has been granted permission by the CAB to participate in all accident investigations involving air traffic control.

► **Air Line Pilots** reports that 17 pilots flying commercial routes under 60 miles of age. ALPA president Clarence Sams told the Senate Commerce Committee that "we are requesting maximum use of paid pilot ratings so as to reduce time during" as emphasizing his point that the solution before a congressional age and phased license a vague.

► **Assessment of urban air carrier acquisition costs** of the CAB in rate making and route certification was suggested again as recent testimony of the House Appropriations Committee. M.C. McHugh, CAB secretary and controller, testified that levying of charges against individual carriers as applicants before the Board had been studied as a means of recovering regulatory costs. Study was suspended, however, as complained with a request from the Senate Interstate and Foreign Commerce Committee pending an investigation to determine whether such a plan would require statutory authority.

► **Civil Aeronautics Administration** is dropping 15% of its engineering staff to get transport and related problems.

► **Civil Aviation Board** is authorized five live inspections in its 127 personnel employees. They include general counsel at GS-15, associate general counsel at GS-14, director of the Bureau of Air Operations at GS-14, associate director of the Bureau of Air Operations at GS-13 and executive assistant to the chairman at GS-12. Board Chairman James Duffee told a House appropriations subcommittee that he believed the CAB to be the most efficient independent regulatory agency within the federal government.

► **Aeromexico** purchased two Bristol Britannia 102s for July or August delivery. Aeromexico expects to get a Mexico City-New York route, where it will operate the Britannia nonstop. The airline now operates Convair 540s and Douglas DC-4s and DC-6s on its Central American routes.

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Airline Traffic — February 1957

Final analysis

³ May be transferred to India.

united by a common wish from all the agents to the (U.S.) Administration that

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MISSILE ENGINEERING



UNITS IN SIGHT: Two tall towers to complete combustion chambers are tested in the composite test building of the Army Ballistic Missile Agency at Redstone Arsenal. The cold calibration test stand is in the background (top and left of center).

Hand-Picked Team Develops Jupiter

By David A. Anderson

Huntsville, Ala.—Development of ballistic missiles for Army Ordnance Corps is assigned to a hand-picked unit for a top priority. The Army Ballistic Missile Agency.

The Agency's work load is markedly proportioned between two major missile efforts:

- Redstone XSM-64, a mobile-to-surface tactical missile that doubles as a development vehicle for the extremely long range ballistic missile. Redstone stage is approximately 200 miles. The propellant is produced at the Cheves Chip City, Okla., plant. Training and indoctrination has begun with Redstone and it will soon become a field weapon with the Army.

- Jupiter, a mobile-to-surface intercontinental range ballistic missile (IRBM). Range requirement for the missile is 1,500 nautical miles. Jupiter was originally planned for eventual use by both Army and Navy, but the recent decision to award the Secretary of Defense Will not split departmental responsibility for missile of IRBM range from the Army and give it to the Air Force. Jupiter will be evaluated technically later this year (1957) against the Air Force standard. Design completed, the IRBM and the better version available will go into production with the Air Force and Navy.

Commander of ABMA, Lt. Gen. T. J. Hudner, recently reorganized the Agency as Nov. 1955. Chief civilian material on



COLD CALIBRATION stand permits tests under simulated operating conditions.



MOBILE TEST STAND is used for launching Redstone missiles.

operating level is Dr. Werner von Braun.

ABMA's organization is unique within the framework of U.S. missile development programs. On a chart, it is a single box with a single line connecting it to the Office of the Chief of Ordnance. There are no other echelons, no other levels of responsibility or authority.

Autonomous Group

It is an autonomous, self-contained organization with the capability to oversee the ballistic missile program from basic research right through to the state of assembly to storage. The Agency does research and development, design and prototype manufacturing, testing and firing of ballistic missiles. It has its own staff and works for ballistic missiles only.

It designs and controls the infinite missile pipeline between autonomy and ballistic missiles.

ABMA operations are along the lines of two concepts: fire to Army Ordnance.

- Munition concept, which places responsibility and authority for design, operation and procurement of classes of material with a single armament authority at Defense, communication at Johns Hopkins at Rock Island and authority at Redstone. ABMA is an Agency, not an armful. It is not, as many mistakenly think, a part of Redstone Arsenal, although it is based and otherwise supported by that arsenal.

- Weapon system concept, which places responsibility for development and manufacture of a new weapon into the hands of a single authority. This concept has been part of written Ordnance Corps policy since 1947. One of the first such versions was the Army's Nike antiaircraft missile with Werner Klemke as carrying the complete responsibility.

To operate within these conceptual boundaries and to carry out its defined mission, ABMA has developed an organizational pattern different and partly new. Gen. Hudner has the usual executive staff and service staff officers to meet military establishments. But the strongest link on the ABMA chief command staff is the Army Materiel Office and the Materiel Division.

- Development Operations Division, consisting of four Missiles groups and a technical liaison group.

- Industrial Operations Division, made up of the procurement operations and production organizations branches.

- Support Operations Division, covering maintenance, repairing, supply and distribution and training branches.

Biggest of the three with it the Development Operations Division, headed by Von Braun. Here is concern limited the research and development, tested the missile under simulated combat or expanded for

static facilities—with additional ones being built—but most of the men below the first floor are the first anywhere. Digital and analog computers, a March 6 wind tunnel with a 14-ft square test section, and a new vacuum and increased pressure chamber addition to test fixtures in a vertical attitude under simulated loads, are all part of the extensive laboratory equipment.

But the outstanding portion of the facility is the test stand area.

Test Area Two

The protruding towers of Test Area 2 mark the farthest south of ABMA's modern headquarters building. Dominating the grouping is a 140-ft high concrete tower capable of carrying two Japanese jet fighters test rear of the complete missile system.

In its present state the hot area comprises about \$12 million in structures.

Technical backlog for these weapons and engineers is a collection of solid



ARMY REDSTONE is dual purpose surface-to-surface missile and development vehicle for Jupiter IRBM project of Army Ballistic Missile Agency. Redstone is a two-stage missile; separation line of warhead is just below upper boosted system. Thrust unit for retrograde control surfaces on uppermost fin.

and equipment. It was designed and built out with the size of engines they desire in mind, so that any foreseeable missile, gun system, sub-system or component could be checked out under simulated operating conditions—cold or hot—at any stage of its development.

To do this, the ABMA assumes planned four test stands:

- **Component test**, where units coupling in are from small valves and regulators to complete combustion chambers can be tested under environmental conditions. This is the first stage of an engine's development.

- **Cold-flow stand**, where powerplant components can be checked either in individual pieces or as a complete system with simulated operating combustions. This is the stage indicated here as "cold" tests without combustion to establish the basic flow parameters of the system.

- **Pneumopump stand**, where a complete complex pneumatic powerplant system—fuels, combustion chamber—can be positioned on a vertical tower and run through a complete flight cycle. Status performance, starting, shutdown, consistency of performance are just a few of the major results from tests with such a stand.
- **Static test tower**, where a complete missile—such as one to be delivered—in flight tested as a complete assembly. This large concrete tower is the first of its kind to be designed instead of being subjected to a minimum of design to the same existing towers that could go up to 100 ft in height per panel. It is an Enclosed Test Stand of booster, payload and service arm can be repositioned to accommodate new configurations. In three weeks time, the stand can be completed, allowing to take on new shape of missile.

It was designed to handle any fineness, any shape, and size that the customer might demand. Neosho is standard 45 ft Navy tripod crane which houses the assistance to load out of the tower.

The stand can test two complete missiles at once because of its double-sided design. Near the base are a pair of short angled buttresses that are the blast deflectors. Down their inclined faces are slides during the tests to protect the concrete surface and the lighting. The stand water system has a capacity of 12,000 gallons per minute.

The static test stand, the pneumopump stand and the cold-flow stand are all tied into a single data gathering system.

Other laboratories

Names of the other laboratories in the ABMA complex, describe their functions. Aerodynamics separate the wind tunnel and drives air techniques for model and flight testing. The Concepts and Controls laboratory, in addition to its obvious tasks, also develops and operates simulators.

Mobile prototypes are built by the Fabrication laboratory, which also is charged with the responsibility for guiding production of the missile in its various industry.

Guidance and Control laboratory contains the inertial navigation system work, that begins with the instrumentation aspect used in the V-1. A major contribution of this lab has been its work on the steering gyro with extremely low drift rates.

Locomotion and handling apparatus and its development is the responsibility of that laboratory. The nine mobile units that comprise a mobile bottom were planned and developed at this cost.

Part of the Structures and Mechanics laboratory hasn't been built yet, but it's a multi-million dollar three-story structure that will give the lab much needed space to carry out the job of structures development and test. Part of the way, building will be a vertical structure that will take an intermediate role for carrying out simulated flight load tests.

Structures Analysis and Reliability laboratory



Rocketdyne Occupies Neosho Plant

Construction of rocket engine test stand (above) at new facility of Rocketdyne Division-North American Aviation, at Neosho, Mo., across street in employe occupancy manufacturing building (below). Building has 40,000 sq ft of floor space.



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Right now, limited quantities of Olin Aluminum are being produced at four locations, and soon an initial annual capacity of 250 million pounds will be a reality.

Benefiting from Olin Mathieson's already extensive experience in the metals field, Olin Aluminum will become a major source of unusually fine-quality Aluminum. And as a result of its full integration down Bechtel's rolling mill—Olin Aluminum will be in a position to assure its customers a dependability of delivery that will be of vital importance.

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Of equal significance is Olin Aluminum's new concept of service standards. Its new plant facilities will be the finest, most modern in existence—that insuring the ultimate in productive quality and economy. Its technical staff is composed of men of broad and extensive experience—ready to work side by side with your own engineers toward the one best solution to any of your Aluminum problems. And Olin Aluminum's new sales team consists of men with a minimum of five years of thorough experience in the Aluminum field.

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sonnel—will result in Aluminum of competitively superior metallurgical quality, tolerances and finishes.

A \$300 Million Investment

Behind the birth of Olin Aluminum lies an exciting industrial drama. Recognizing the growing world need for Aluminum, Olin Mathieson—already greatly experienced in the production of two-dozen metals through its Western Brass Mills Division—joined with Revere Copper and Brass to organize the Olin Revere Metals Corporation. The purpose of this united effort was to construct and operate the complete facilities necessary for the production of primary Aluminum. The Olin Revere Shipping Corporation was formed to import the huge quantities of Bechtel needed, and funds were had for its three great new 16,000-ton ore ships of revolutionary design.

Simultaneously, at Bonnade, Louisiana—an ideal deep-water port—construction was begun on a large new

Aluminum plant. And on the Ohio River, at Clarietta, Ohio, work was begun on the first reduction plant ever to have its own integrated coal supply and power generating facilities. These new plants, front of a \$300 million investment, form the assured source of supply for Olin Aluminum.

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Two-thirds of the output of this fully integrated primary Aluminum production system will go directly to the new Olin Aluminum Rolling Mill at nearby Osceola, Ohio, and to other Olin Aluminum facilities in the Midwest, on the West Coast and on the Gulf Coast. From these smelter plants will flow eastern-made Aluminum better adapted to your individual needs than may you have ever before been able to obtain. That is the goal of Olin Aluminum: a new concept of quality and service in the Aluminum industry.

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"Weaponization"

"Weaponization" is the latest of the coined words generated by missile scientists. It refers to the process by which a basic missile prototype is integrated into a complete weapon system with all its necessary handling, servicing, transporting and launching gear. Chronologically, weaponization occurs during the latter phases of the development test program, although planning and designing for weaponization has generally begun—almost at the start of the program.

Today is another of the different types of assignments that have been going up in ABMA. Systems analysis is still evolutionary. Reliability, generally assumed to be everybody's responsibility and the function of product reliability, is one assigned task of this lab. At every stage of weapon development, specialists from this unit are there with recommendations and analyses, aimed at improving the reliability of components and systems.

String of test missiles is down at the Air Force Missile Test Center at Cocoa, Fla., by the Mank Firey Laboratory.

Missile Personnel

The Industrial Operations Division, headed by Col. John M. Stark, has a dual responsibility in furtherance of the life cycle of ballistic missiles as they progress through the Research and Development phase into full scale production for field use.

During the Research and Development phase, which is the primary responsibility of the Development Operations Division, the Industrial Operations Division has the necessary support by assisting in the timely procurement of services, research and components necessary for the laboratories and test of missile prototypes.

At the design of a new program to be developed, the Industrial Operations Division is responsible for "weaponization," or the term as applied to the integrating and packaging personnel of the Industrial Operations Division assume responsibility for full production and procurement and completed engineering support. This, of course, includes the establishment of a Quality Assurance program designed to maintain the reliability and provide for constant improvement of the missile system.

The Procurement Operations Branch, a major organizational segment of the Industrial Operations Division, receives the Development Operations Division's requirements for contracts and oversees the administration of prime Research and Development contracts to be fabricated at that agency. Five teams which are operational, the Support and Testing Division likewise furnish technical requirements for missiles for evaluation.

fusing, trussing and stock piles for field use. The sum of all these requirements culminates in a planning function which includes a planning up of all components and a study of such items as lead times and a determination of the minimum deadline for component procurement.

Once the procurement schedule is established, it is placed under continuing coordination with all necessary segments of the agency to insure mutual accomplishment. All changes are easily analyzed to insure that no unnecessary delays will result. Changes in lead times are clearly noted and applied in forward planning. Preparation of budget data and future procurement requirements that have the benefit of current experience.

Once a procurement plan is known, action is taken through the Ordnance Directorate to acquire the required materials and equipment required. Good procurement practices must result in early and efficient delivery of materials in accordance with procurement commitments in selecting sources.

When contract is concentrated, continuous follow up is maintained to insure completion with desired delivery requirements.

During the Research and Development phase of missile system programs under ABMA organization, the Engineer-

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Engineering Branch of Industrial Operations Division is responsible for flying power systems and will take full charge control of a production engineering program. To this end, Engineering Branch personnel keep close liaison of Research and Development progress and anticipate production engineering requirements to the extent that these do not compromise Research and Development efforts. This quality assurance program it intended, arrangements are made for preparation of documentation in accordance with approved format, and any testing necessary is conducted in liaison between the Research and Development groups and the Test and Evaluation Operations Branch which processes all technical publications.

Design Improvements

Second the aforementioned program began during the Research and Development phase, the Engineering Branch of Industrial Operations Division is fully responsible for engineering work as long as AFMAs cause certain when they are ready for production as a tactical weapon. The design evolved under the Research and Development program is internally homogeneous, reliable, but the design can also be considered flexible. The design can be modified so that improvements are made to eliminate components that may be difficult to produce or may require unusual or critical materials to eliminate potential structural stress which may be replaced by modified ones without affecting functioning, or to improve reliability, operability, maintainability, or compactness which are located during operational reliability evaluations and service use.

Under the Development Operations Division of AFMAs, the Engineering Branch of Industrial Operations Division is required to perform periodically a technical evaluation function. Detailed designs and engineering drawings produced prior to completion of aircraft development are provided to engineering service from industrial organizations or other Government agencies.

Management Role

In its managerial role, the agency branch of Engineering Branch includes the maintenance of controls to insure that all changes to initial designs of system requirements to support the goals of the program and the program, and to meet one requirement desirable from either technical viewpoint, and are retained so that there will be timely availability of all components which are required for delivery of complete, spacious, useful options on established schedules.

A staff representing a cross-section of the Department of the Army is assigned to the Agency with a single office. To bring the influence of the user to bear

on the development program at the earliest date.

The Army hopes to save as much as two years on the development cycle of its missiles by using this approach. The Dept. of the Army staff can monitor the program so that the five uses of the same aircraft—aggressiveness, simplicity, reliability, accuracy and flexibility—can be built into the missile system at an early stage.

Senior officer of the Army staff is Col. C. G. Patterson, whose background includes service on the Research and Development Board as a trainee at the War College, where his thesis was a study of the influence of technology on

strategy. Other offices on the staff are drawn from Continental Army Command, Office of the Deputy Chief of Staff for Logistics, Field Forces—but the majority are combat air officers.

Patterson emphasized that the Army

officers are working part of the Agency and not simply liaison types. Only five

of the agency's thirteen administrative staff function, the remaining 12 are on

posting in the laboratories.

Feedback from the Army officers to the management Board of the Army General Aviation Board is constant. General and intermediate Board members are invited to attend the War College, where the focus is a study of the influence of technology on

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Such achievements show Pratt & Whitney Aircraft's ability to develop the right kind of engines at the right time...whether piston engines, turboprops or turboprops—or entirely new engines of the future.

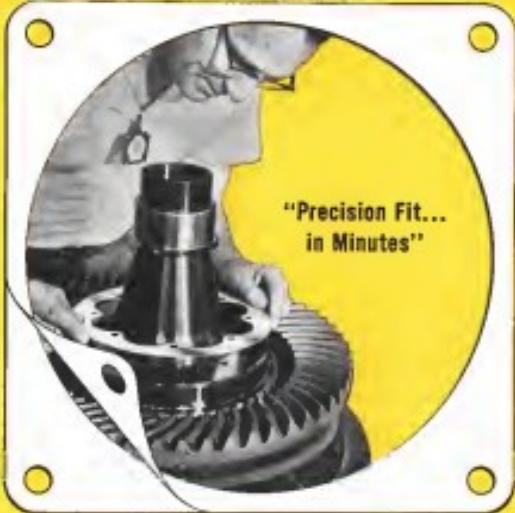
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Practical Navy Zumi rockets are carried, launched from some flying wings in which they are delivered from factory and stored. Pads are provided after long flights, which cost \$150 apiece, to replace those for World War II High Velocity Airplane Rocket (HVNR). Zumi is a solid propellant rocket designed for air-to-ground and anti-aircraft use. Clamping (below) shows holding fix. Rocket was developed by Naval Ordnance Test Station, China Lake, Calif.



the Air Force Missile Test Center, Coors, Fla. Sponsored by the missile performance group, the Army made the decision to go onto a BOMI program back around the time of Rockford's missile development division.

Gen. Medans was assigned the job of engineering a new agency to handle the manifold problems of ballistic missiles for the Army, and ABMA was the result. Work on the Redstone weapon started in December 1954, and on Jupiter progressed on schedule. The early flight of a liquid engine when the first test of the Winton drogue brake at the Edwards area.

The stems had hardly appeared in lead pages before Medans issued a statement clarifying the problem. It was posted on bulletin boards and passed with visiting firms from office to office. It is credited with averting some of the major panics that always result when policies elsewhere change the direction of a weapons program.

With the following week Medans is again faced with some of the panics in the Winton forecast, this time in the field of heat shield development work at the Jet Propulsion Laboratory.

"After all, this is not a very popular firm," Gen. Ordan said. "We've often made mistakes for other services."

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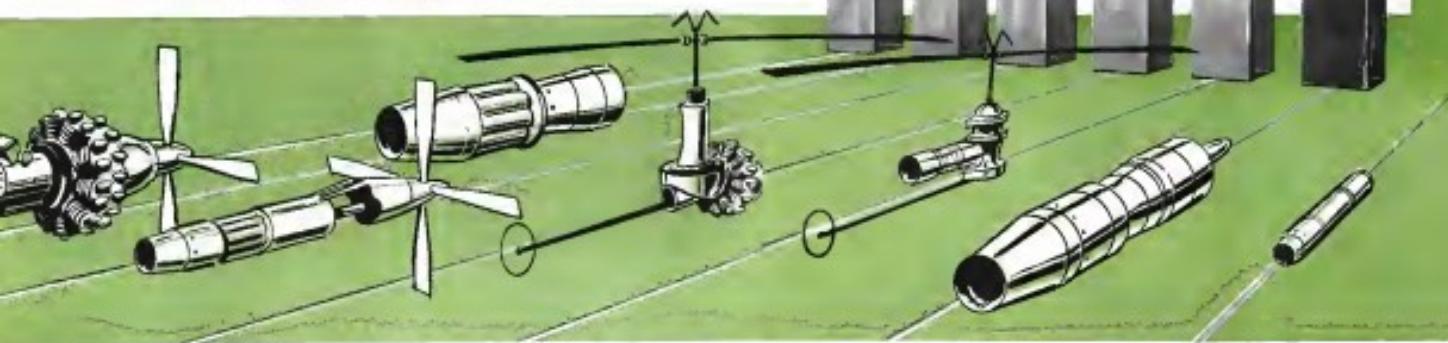
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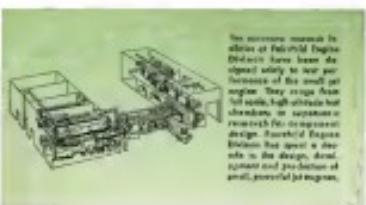
Highly compact, with low frontal areas, the small jet engines will deliver thrust/weight ratios starting at 8 to 1 with a long range potential of more than 10 to 1. They will be used in the high performance, lightweight trainers, interceptors, target drones, piloted aircraft including missiles and intruder-class passenger and cargo jets of the nation's sixties. They will also be used to power fighters and utility cargo craft, executive transports, and will make jet Short Take Off and Landing (STOL) and Vertical Take Off and Landing (VTOL) aircraft practical.

The small jet engine may be used singly, in pairs and in clusters. It provides multi-engine reliability in aircraft of a size now wholly dependent on a single engine. The small jet engines will produce greater versatility and utility in airplanes of tomorrow.



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The enormous resources available at Fairchild Engine Division have been devoted to the development of the first small jet engine. They range from full scale, high-altitude test chambers, to research in materials, to computer design. Fairchild Engine Division has spent a decade in the design, development and production of small, powerful jet engines.

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The Aeroproducts ram air-driven pump, mounted behind the cockpit of the USAF F-100D Super Sabre, produces sufficient hydraulic pressure for flight controls in case of either engine or hydraulic failure.

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Lightweight ram air pump is mounted behind cockpit. In emergencies, or from engine failure down can be reversed by the pump to drive the ram-air pump.

Weighting only 11½ pounds, the Aeroproducts ram air pump produces air and hydraulic pressure for flight controls in case of either engine or hydraulic failure.

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X-7 Lands On Nose Spike

Recovery and ground handling details for Lockheed X-7 canard test vehicle are shown at this assembly at Holloman AFB, N.M. Below mounting under wing of B-57, the X-7 is lowered on center-wheel dolly (top). Nose spike of vehicle is used for ground handling (left). Hydraulic shock absorber (right) before the spike is lowered into a truck (center). Vehicle is shown in repositioned speed by center hoists (far center), and center can is where main landing gear is located. X-7 is used to test the Marquett 11 or -12 solid rocket motor. Boeing Research (SW Eng Co) built X-7. Lockheed built a driver version of the X-7, drove out the QFS, which used a different and larger Thielert solid booster. This version was destroyed in crash at White Sands.



BOAC Interested in Vicker Civil Version

London-British Overseas Aviation Corp. is interested in a civil version of the Vicker jet liner.

In its annual report to Hasleys Page shareholders, the company chairman, Sir Frederick Hasley Page, said BOAC is taking about such a jet for use in the mid-1960s. He said it is a more advanced civil development of the Victor than the EIP-57 jet transport offered to BOAC in 1957.

He did not give further details of the new project but commented that

it was unfortunate that work started was not shown earlier, for the country might well have used the same and less of similar BOAC in operating on American aircraft.

The EIP-57 could have been or very well indeed American jet if it had been ordered in 1952. He described it as 100-passenger aircraft capable of nonstop operations between London and New York.

Concern is growing at present in the continued stock of super音速 transports which has been undertaken by the British aircraft industry. The chairman and Hasley Page, in studying supersonic fighter characteristics,

is now making an analysis of the 300 and drag of supersonic wings.

The annual review also applauded the firm's work on boundary layer control. Programs have been submitted to BOAC for long range transatlantic transports. The report stated that all weight of the Victor B.52 could be reduced from 400,000 lb to 270,000 lb without sacrificing performance if known how were used.

De Havilland Warns Against Fund Cuts

London—Chairman of de Havilland Aircraft Co. warned that large British defense cuts will place Britain's aircraft industry in a difficult position to compete with foreign manufacturers.

W. E. Knowles, chairman of de Havilland Holdings, Ltd., and that the U.S. industry has strong government backing, with military orders making up nearly 90% of American industry's total sales.

Every possible support would be given to British research and development efforts and to new projects so that the industry can continue to share in world markets for the world's aircraft.

In the present defense report, the chairman disclosed that production of Venoms and Vampires for the R.A.F. and Royal Navy has been cut back. Production of Gnat and Gannet jet fighters is also declining. Advanced rocket engines of two firms, Br. Aerospace and Fairey, are entering the production stage to be installed in what he termed a new generation of military aircraft.

Fight trials with the Spectre rocket engine already have begun. Novice and flight training is in larger schools of the Commonwealth Air Forces.

Government Explains Troubles With Hunter

London—Prime Minister Harold Macmillan and most of the ML IV aircraft crash, with all requirements for operational use at Abingdon. Supply Minister Aneurin Bevan told Commons.

Engines on the ML III and IV Hunter jets were liable to stopping when the gear were fixed. Testing of modified engines on ML IV aircraft began in February, two years after the trouble was first experienced.

James said it was not considered worthwhile to modify the ML I airframe.

The ministry was asked why it was first found that the elevator controls of the Hunter were not effective at a certain speed, when the readjustment of a moving telephone was first disclosed when this modification was

PRESSURE

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The poppet-type helium relief valve, illustrated below, regulates a missile's fuel tank pressure at 35 PSIG at PSIG at flows from 0 to 15 lbs/sec.

An integral check valve permits flow of ambient air into the fuel tank if external pressures fall below ambient.

Also provided is an integral override mechanism—controlled by a solenoid valve—which utilizes an external source of air at 400 PSIG to open the valve for vent purposes during filling. This versatile valve can be adjusted for other operating pressures by simply resetting the calibration of the pilot sense unit.

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TEMPERATURE: -50° F to +160° F fluid and ambient.
ELECTRICAL POWER REQUIREMENT: 120V AC 60Hz 10VA
RELAY VALUE: 10mA at 120V AC 10W 10A

SERVICE FLUID: Argon, helium, or low-boiling vapor
PRESSURE: 35PSIG ± 1 PSIG operating pressure
90 PSIG proof pressure, 16 PSIG burst pressure
TUBE SIZE: 1/8" O.D.
WEIGHT: 5.8 lbs

*Any desired pressure under 40 PSIG can be furnished.



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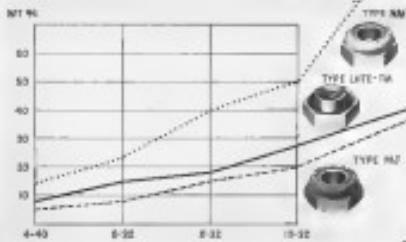
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SOLUTION: An excellent way to consider choices is the ESNA low weight fastener for your requirements. For example, here are three basic hot type—each of which offers its own particular advantages:

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<input type="checkbox"/> Brochure for Types M, M8, M10	What self-locking feature would you prefer?
Name _____	Date _____

shorter and whether he is satisfied that the modified controls are as effective as those fitted on the North American T-38—series or eight years ago.

He replied that the elevator control was first reported as having "certain shortcomings" in January, 1953. It was decided in view of that year to proceed with the design of a flying tail. First fully modified aircraft from new production will be delivered in June, 1954.

"The aircraft as modified will be a more advanced and more powerful jet craft than the T-38," he noted. "The M-6 VI has enough forward speed to permit normal service takeoff."

"Forward air is not defended in the field of fighter strength, it is because we were more interested than the Americans to know more and less is experiencing in supersonic flight."

HDM 105 Transport Makes First Flight

Low-level test flight of the HDM 105 experimental light transport with high-wing was made last week.

The experimental aircraft is a result of collaboration between British designer J. G. Miles, Ltd., and the Socata des Avions Dassault-Doubs. Wing, narrow wings supported by spread lifting struts are expected to give good performance at low cost.

A joint company has been formed to produce improved versions of the prototype. Plans include HDM 105-A, 16 passenger transport designed for short field operation; the twin engine version will be available on short routes to be produced in one year.

Also in the future is the HDM 107, turbo-propelled military transport.

The company also disclosed plans for entering the air transport business. It has applied to the Air Transport Adjudications Board to operate regional scheduled passenger, freight and mail services from the British Seaford Coast to the Channel Islands and the French Coast.

Charles Page Marston and de Havilland Aircraft Incorporated are joint partners in the venture.

Breguet Twin Jet Fighter Is Flown for First Time

Report back of lightweight support fighter 1300 made first flight at Paris Test Course. Powered by two Turbomeca Gabizo turbolifts each developing 7,000 lb. thrust, aircraft is committed entirely of bonded material. MATD version of the aircraft is being equipped with Bristol Orpheus engines. Serial prototype of twin jet version is destined for use in Naval carrier operation.



The first Pantobase BLC transport

The outbreak of military transport demands has been substantially increased with the introduction of the Stroukoff C-134. Prepared for the United States Air Force this rugged heavy-duty transport requires extremely short take-off and landing runs and can operate from any surface—land, sand, ice, water, etc. Advanced airframe design has been

combined with Stroukoff Pantobase and Boundary Layer Control Systems to produce a new type of aircraft equipped for a variety of assault and logistic missions requiring operation without the limitation of conventional runways.

The Stroukoff C-134 is destined for an important role in modern military strategy.

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ACCESSION to 151 and dive status is added to external mounting. Engine control lever and can be positioned under quick release pins or entirely disengaged. Stainless steel engine supports transfer loads to 1,000 lbs hours. "Up" on exhaust deflector gage.



DR. COOLER and tank deck cover gas instant, large cooler and its tank, no other side more transverse. Fins are standard. Bellshaped muffler for breather plenum covers or valve plenum chamber branch outlet. Cooling air exhausted via gill openings.



TURBINE inlet cones and swirl (backwash), drive shaft, outer disk links, two-hub/turbine, speed reduction unit and gearcase heat sinks.



EXTERNAL cargo hook can handle loads too awkward to store in K-600-3 cabin via door shell doors. The K-600-3 is a modified version of Kaman's HOK-1, built for Navy.

Two Turbine Versions of HOK-1 Offered

Kaman K-600-4 Performance

Powerplant	2-Place	3-Place	2,000-lb Cargo Capacity
Useful load (lb.)	1,800	2,240	3,790
Crew	200	280	280
Passenger	300	740	
Cargo			3,000
Fuel	1,200	1,300	470
Auxiliary power	100	150	100
Empty weight (lb.)	3,955	3,955	3,925
Gross weight (lb.)	3,735	6,295	7,725
Standard Day Performance			
Vertical climb @ sea level (ft/min.)	980	480	
Vertical climb @ sea level (ft/min.)	1,416	1,580	140
Absolute hovering ceiling (ft.)	13,200	12,050	
Absolute hovering ceiling (ft.)	18,000	18,200	4,000
Maximum climb @ sea level (ft/min.)	1,150	1,130	560
Maximum climb @ sea level (ft/min.)	1,594	1,470	980
Service ceiling (ft.)	33,300	30,600	12,700
Service ceiling (ft.)	151	97.3	53
Service @ altitude (ft.)	105,000	103,000	95,100
Ranges @ sea level (mi.)	177	77	
Ranges @ sea level (mi.)	200	112	24
Compass error (deg.)	73	81	88
Choke speed (ft/min.)	60	77	60
Performance @ sea level (ft/min.)	2,47	2,34	784
Performance @ sea level (ft/min.)	3.58	3.25	1
Cruise speed (ft/min.)	45	44	31
Cruse speed (ft/min.)	45	44	31

*Normal power: 600 hp. †Military power: 720 hp. **Emergency operation.
One-pilot operation.

New Tidewater effort to obtain military contracts from U.S. and Canadian military services for five new four-bladed versions of the HOK-1 helicopter is being made by Kaman Air Craft Corp., Bloomfield, Conn.

In commercial interest divisions of these models, Kaman will undertake Civil Aviation Administration certification of them, but military orders are not present a complete system for Civil Aviation USA.

Both types are modified versions of the primary-engine HOK-1, which has been in production since 1957. Some 400 HOK-1s are in service and ten more are in import conditioning, said Kaman. New models have developed 15%.

*K-600-4 is powered by a single Lycoming 151-hp engine, which Kaman has been testing since last September. To date the K-600-4 has completed more than 50 hr of operating time, including 10 hr of tethered test and 10 hr of flight test during which it has attained speeds up to 115 ft/sec and hover to 7,000-ft altitude.

+K-600-4, another version of the HOK-1, is still in the engineering stage; program calls for installation of two British-built Blackburn & General Aircraft license 600 turbines. Kaman has purchased two of these powerplants and is busy on the drawing boards developing the conversion. Parts studies of the Tidewater 150-hp version HOK-1 have been submitted to U.S. and Canadian military authorities.

Of the two projects the Tidewater

to Military

K-600-4 will probably be of greater interest to commercial operators because of its single-engine operating characteristics (see box p. 76). Tidewater passed an 110-hp Air Registration Board certification test in England and is producing, Kaman told Aviation Week.

Data relating to power developed by the new Tidewater has been brought in line with the T-53 to provide accurate comparisons. Tidewater maximum power is 980 hp, continuous rating is 850 hp. Actual derived power for the K-600-4 is not available at this writing, but probably will be higher than rated ratings of the T-53, according to Kaman.

Preliminary aerodynamic analyses show the K-600-4 cargo configuration will have short operating costs of \$1.37 per ton-mile. With a pilot and one passenger, short end costs are estimated at 15 cent/mile.

Intake gases from the switch house P&W R1340 piston engine to turbine installations is a pump-in starting capacity from five to eight persons or 5,000-lb cargo, made possible by appropriate design of the intake system, says K-600-4. In addition, fueling is external, above the cabin. The piston engine is mounted at the rear of the cabin, accessible with access to the latter by means of a transom split-class slide door. Doors are retained in the fuselage prior to removal of the transom.

Fast operating procedures are needed considerably with the turbine powerplants. A turbine power control system (programmable) automatically provides proper power demanded by the pilot when he

Kaman K-600-3 Performance

Powerplant	2-Place	3-Place	1,000-lb Cargo Capacity	5,000-lb Cargo Capacity
Useful load (lb.)	1,800	2,340	3,770	300
Crew	400	400	340	
Cargo				3,000
Fuel	1,300	1,300	470	
Auxiliary power	100	100	100	
Empty weight (lb.)	3,790	3,790	3,790	
Gross weight (lb.)	5,590	7,190	7,190	
Standard Day Performance				
Vertical climb @ sea level (ft/min.)	1,100	480		
Vertical climb @ sea level (ft/min.)	1,490	1,500	300	
Absolute hovering ceiling (ft.)	1,400	1,300	480	
Maximum climb @ sea level (ft/min.)	2,300	1,770	1,280	
Maximum speed (ft/min.)	167	104	86	
Absolute hovering ceiling (ft.)	18,000	14,300		
Absolute hovering ceiling (ft.)	19,000	12,700	7,000	
Service ceiling (ft.)	35,500	25,000	15,200	
Range (sea level, mi.)	260	258	150	
Endurance (hr.)	3.8	2.6	1.6	
Military Day Performance				
Hovering out of ground effect (ft/min.)	9,200	2,000		
Hovering out of ground effect (ft/min.)	10,200	6,000		

achieves pitch stall and in auto rates twice rotor rpm at the constant speed prescribed by the pilot.

Maintenance is less than because of the engine's external mounting. In addition the T-53 being a free turbine, no weight check system is required.

Comparative analysis of K-600-3 performance with its turboshaft-powered outstrips weight weight of the K-600-4 to 4,010 lb. at the K-600-3, 3,790 lb. of the K-600-4, 3,915. Max gross gross weight of the K-600-3 is 7,190 lb., the turboshaft-powered model uses

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for the turbine-powered versions at 6,370 ft.

HOK-1 with T53 currently installed is operated by Kaman on a fixed contract from Navy, to provide flight development on the powerplant, which is a U.S. Army project under direction of the U.S. Air Force Power Plant Laboratory. Turbine HOK-1 is scheduled to be delivered to Lexington Command about a month from 100 hr test.

Kaman has provided additional company funds to develop the T53 turboshaft derivative into a prototype of a jet-powered "jet" being developed.

Surface Protection Needed in Jet Molybdenum

Suitable surface protection and better joining methods are the primary needs for utilizing molybdenum in jet engines. R. J. Begley, Assistant Chief Turbine Doc., Wright-Patterson Comp., told the Society of Automotive Engineers' Materials and Processes Meeting.

Friction-squeeze joints were obtained from a number of sheet metal thicknesses via vibration brazing from Inconel clad 99.5% Chromium-Molybdenum alloy, Begley said. The shear stress was both adiabatic and fibrous.

Maximum speed at sea level for the K-600 is 90 Lts., turboshaft versions have a maximum speed of approximately 96 Lts. at about 7,200 ft. Maximum weight limit of the piston K-600 is 2,150 lb.

No particular difficulties were encountered with the bonding operation when the metal was heated to 600-800°. The leading edge of the nose cone



Cornell Tests Bomb Drops

Stroboscopic photo shows trajectory of a 1,050 pound practice bomb also shows the bomb bay (top left) of a model aircraft inverted in Cornell Aeronautical Laboratory's Mach 1.3 wind tunnel. Bomb drops in Cornell Aeronautical Laboratory's Mach 1.3 wind tunnel are helping solve bomb bay aerodynamic configuration problems before they delay operational deliveries of new USAF fighters and bombers, according to CAL engineer Willett Schaeferwright. While it is simple to predict a bomb's trajectory once it has passed through the turbulent region near the bomb bay, the turbulent region may come the bomb to湍流 and cause them later to flip back into the bomb bay. So the CAL's model bomb drops have been kept to a minimum time, but future ones will simulate high performance aircraft making supersonic drops.

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For these reasons, the Honeywell Transistorized Fuel Gage was a logical choice for the Boeing 707, the Douglas DC-8, the Lockheed Electra. The transistorized fuel gage is another Honeywell "first"—made possible by Honeywell's development of the power transistor.

For more detailed information on the new Honeywell Transistorized Gage and its applications in both commercial and military aircraft, write to Dept. AWI-125, Mid-States 661, 2600 Ridgeway Road, Minneapolis 13, Minnesota.

PAN AMERICAN AIRWAYS



Douglas DC-8. Pan American, Panagra, and Eastern Airlines have ordered 31 Douglas DC-8 jets with Honeywell's Transistorized Fuel Gage. Deliveries are to begin in 1959.



Boeing 707. Deliveries of this newest transport have just started by 10 different airlines, with delivery scheduled for 1959 and 1960. The 707 will be equipped with Honeywell's Transistorized Fuel Gage.



Lockheed Electra. 8 different airlines have placed orders for a total of 125 of Lockheed's turboprop transports, with delivery to start late in 1958. The Electra will be equipped with Honeywell's Transistorized Fuel Gage.

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placed by laying with Ni-Cd-H after and the insulation at the exposed top and bottom edges of the case was protected by applying a thin layer of the insulating tape to each end.

The final dimensions of the tank and various tank sizes are as follows: installed is a conventional first stage turbine nozzle. During the tests, temperatures of 2,000° were encountered, and, with the average gas temperature at tank location 1,300°.

Though cracks did appear at the lowest trailing edge joint, Blight said that the resulting conditions at the welds between here were not serious.

Landing Aids Advocated For Good Weather Too

Use of automatic landing aids in good weather as well as bad was advocated by Brig. Gen. Joseph D. Collier, director of USAF flight safety research at the Society of Automotive Engineers' Aviation meeting. Landing aids deserve account for 45% of all major Air Force flying mishaps, he said, and the majority of those occur during normal landings in good weather.

Increased landing speeds and the difficulty of handling high performance planes at low speed are not the sole factors causing landing mishaps.

The pilot's critical preoccupation with aircraft stability at low flight at high altitude where he is remote from ground distance information. This is believed to contribute to the number of over and under shoots the Cessna 180 fighter pilots make on landing.

The Air Force is studying B-57s as testbeds to study and other proposed and existing automatic landing systems in an effort to cut this problem.

Aerojet Runs Test On Thrust Reverser

Los Angeles-Aerospace General Corp., has successfully tested an Aeroflex thrust-reverser on an Allison JT11 jet engine. The thrust-reverser was developed by Aerospace under a contract from the French firm SNKCM.

Test on the JT11 involved 170 hours of runs. Maximum reverse thrust, the tests showed, could be obtained in about 34 seconds.

With modifications, the thrust-reverser could be adapted to other jet

Vertical Lift Research Craft Makes First Flight

Short SC 1 vertical lift research aircraft made its first flight last week at Edwards Air Force Base, lasting a quarter of an hour. Series of flight trials will probably attempt to convert from hovering to level flight or to take off vertically.



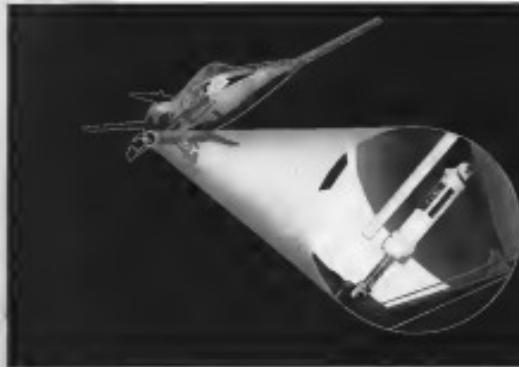
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Comparison of (left) standard low-pressure AEROL, (middle) medium-pressure AEROL and (right) high-pressure AEROL. Note reduction in diameter of shock-absorber package.

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MANAGEMENT

GE to Put Accessory Department Under Weapons System Concept

By Robert Cushman

Lynn, Mass.—General Electric Aircraft Engines, Turbine Dept., is shifting its engineering and sales functions to fit the weapons system concept of USAF and Navy.

USAFA's weapons systems photographs have been placed on the same plane level as Convair's B-52 weapons system.

It is being felt that GE's top-ups (the subsystem level) as outlined by GE management policy change

result. This is usually in the form of power hydraulics or wind direction energy.

In the case of a missile, the electrical generator and other needs energy for the commanding electronics located there from, but needs power to run itself. In addition, wind turbines attempt to charge batteries, power the beam of a ground-controlled electronic gun, etc. Also, using various power transformers and AC/DC converters, can be used as a base standard for navigation and other devices.

Most popular aircraft are the main propeller plant in the initial source of secondary system energy. Unfortunately, the load and speeds needed for propulsions do not coincide with the loads and constant speed needed for accessories.

This is particularly true in landing, where the engine is idled back but a good portion of the control power is still needed.

In smaller aircraft power is still supplied from motor generators at which time the engine is very likely to be used for the aircraft's atmosphere so that heat or exhaust can be used. In this one mode

greatest power sources are obviously turbines.

Kirkton would not be surprised to see independent power sources used in larger aircraft. For example, he said that in planes of the B-52 category and larger the power demands are becoming such that a 1500-turboshaft engine, taken made by GE in Lynn, just for generating the auxiliary power would not be out of order. Since it would be running at constant speed part of the power division problem, that of defining the constant frequency power from a varying speed source, would be eliminated.

Dries Comparison

If the present time, however, most of the competition remains between power source drives which use main engine compressor bleed air and hydraulic systems driven off the main rotor.

According to studies made by AAI, permanent systems are best for propulsed aircraft in flight with short intervals for takeoffs where the propulsive rotation gearing does not have much space for sheet drives, or for ranges where there is no source of auxiliary power.

Hydraulic direct drives are best for long range aircraft because of their inherently higher efficiency, for engines which are sensitive to compressor loading, for buried engine configuration.

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Martin Models P6M Line

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The Scott Test Console can be expanded to automatically maintain the proper rate of breathing

pressure or applied air pressure or it can be operated manually to determine the effects of unbalanced pressures.

Wherever the USAF personnel pressure suit is used, a Scott Test Console is needed for initial training and periodic indoctrination. It provides a means for determining whether an individual is physiologically capable of adapting to high positive pressure conditions.

Write for Complete Information



SCOTT AVIATION CORP.

121 BRIE STREET • LAFAYETTE, N.J.
Dept. Aviation Div., Co. 15, Box 1700, Staten Island, New York, N.Y. 10314

where they don't add to the friend and the weapons machine.

One of the goals of the new group at Lyon is to program the general power take off problem in a general program IBM 704 computer so that, when the various department heads in an aerospace manufacturer's organization, the group can goad the special case into the computer and in a short order come up with the power solution that looks best.

For the time being this new group will content itself in applying systems power as far as the distribution line. However, the AAF Dept. has other products which could be placed in the same classification system as the 704. The 704 has been working on a line of cartridge-tubeous sections which cost of a very compact package can supply bursts of very high horsepower. If as a 50 lb. package they can produce 20 hp, down to a 24 lb. package they may produce 200 hp.

AAF also has pneumatic actuators and hydraulics for fuel and hydraulic power.

GE in its Direct Current Motor and Generator Dept., Erie, Pa., makes alternators through which the alternators used on the B-52 are being made by Westinghouse.

Although with these three product lines and certain electrical components which are made in GE's Waukesha, Wis., plant, GE would appear to have the complete in-house capability to supply

all of any system it wishes to build. D'Gouawl says that there is no intent that GE will try to make all of the components. For example, he said, GE will continue to encourage from the Price Products, a division of Borg Warner which specializes in prompt, no

stoppage power.

D'Gouawl strongly feels that tool use of a large supplier under the integration concept in try to make everything ready but on a cost will only prove burdensome in the long run. In this respect he advises to the smaller firms to put close attention to the part function and not to get involved about the logistic load and cost of providing special items for these groups.

D'Gouawl thinks that the duty of the parts supplier who relies on price competition with shelf items is limited

New York Airport Passenger Increase

New York-Times of the four airports operated by the Port of New York Authority, LaGuardia, was up 12,000,000 passengers in 1956, an increase of 8 percent over the 39,000 total LaGuardia airport handled. 6,003,390 of the passengers, New York International, 4,900,000; Newark, 2,153,796. Passengers not served by scheduled carriers, had 322,187 plane movements.

An average annual at the airports is said to be more than \$25 million. It is up



TWA Overhaul Base Progress

TWA World Airlines' new \$25 million overhaul base near Kansas City is scheduled for completion in 1957. Single vertical building, low-slung structure at picture, is already to set by the author. Hangar is still under construction. Base is located on Platte County's Mid-Continent International Airport, 21 mi. northeast of Kansas City.

MISSILE PRODUCTS



over 20 years' experience in development and manufacture of systems and equipment for airborne ordnance, and missile warheads.

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MILITARY
PRODUCTS

8.3%, and was up 7.4% to \$2.1 million.

PWA spent \$3.2 million on airport improvements during 1956, expects to lay out \$90.9 million in capital expenses this year. Great spending increases from the four airports and new Manhattan Airport started \$87.9 million during 1956.

Most of the agency's 1956 investment went into Newark, where a \$120-million "terminal strip" is under construction. Installation by Civil Aviation Adminstration of bidirectional traffic control linking systems at Newark and Idlewild was begun during the year.

Of the total passengers, 30,570,000 were domestic and 1,535,393 overseas.

TWA's Burgess Moves Top Level Personnel

New York—Elmer L. Burgess, Trans World Airlines president, in resigning the career top level position is in line with a reorganization plan previously announced (AW Feb. 6, p. 51).

The changes, effected immediately, include:

- Frank E. Brack, vice president-operations, is shifted from Kansas City to New York.
- George H. Clay, former vice president and controller, becomes vice president-administrative services in Kansas City.
- Ronald Dinkworth, former manager treasurer, has been named secretary of the company.
- W. E. Rucker, present auditor, becomes assistant treasurer.
- James Fenney, director of industrial relations, becomes assistant vice president in charge of industrial relations.

In the operations department, was one central Atlantic and overseas regions are absorbed into two basic divisions: continental and transoceanic.

Third held long-time manager of United States operations in Kansas City, W. L. Twinkle will be promoted manager of international operations in Paris.

TWA which grossed \$264,194,000 in operating revenues in 1956, reported a net loss of \$2,337,000. Loss was 78 cents a share on 3,517,836 shares not trading, compared to a 55.497/1000 profit in 1955, or 15 cents a share. Gross revenues in 1955 totalled \$217,414,000.

TWA carried 4,029,000 passengers during 1956, a 13.5% increase over 1955.

Under its new president, economies in reorganization have been concentrated. First full use of a new central base at Kansas City will be possible, new aircraft are being introduced, and rapid world service in conjunction with Northwest Airlines is expected to begin this year.

NEW CALIDYNE 177 SHAKER SYSTEMS



for vibration test
up to 5000 cps.
4000 CPS output
up to 401 Lbs.
load at 1 G.

The model 177 is one of a new series of shakers built especially for rugged vibration tests. It features a unique vibration isolator and forced excitation.

Calidyne shakers are designed to meet the needs of the most exacting vibration test applications. They are rugged, reliable, and can be used in the most severe environments.

For further information contact your distributor or write for catalog.

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EQUIPMENT

Teflon Hose Use in Jets, Missiles Grows

By George L. Chisholm

Roseland, N.J.—High pressure—1,000 psi—Teflon aircraft hose is gaining wide acceptance in a host of flight-control and aerospace weapon systems, both ground and aerial, and their performance and use is so safe.

Cofel R700 is the hose's preferred line. Rosella's Corporation is its new plant here. Company says R700 is being widely sought for use in most new weapon systems because it is the first Teflon hose to meet high pressure capability with the durability factors required in fighter products. Resistance to high and low temperatures and ability to continue action by remote control, unknown, including driving and static water tests.

Compared with conventional 100,000 psi hoses like the MS 20004 Series, the SPS EWB-22 has 30% greater tensile strength and, at 8 million stress cycles, up to 30% greater fatigue strength. These qualities make it feasible, in most cases, to replace a standard MS 20004 Series belt with an EWB-22 of the next smaller diameter. The benefits from use of the EWB-22—in increased structural strength and stability and reduced weight—are obvious.

Concurrently with the development of the EWB-22, SPS produced the Hi-Psi EWN-22 locking nut to complement the belt. It has a high torque strength self-locking nut with a 12-point external wrenching surface. It makes possible the high wrenching torque needed to preload the EWB-22 to the greatest advantage.

Along with Hi-Psi EWB-22 belts and EWN-22 locking nuts come other new additions to the complete SPS line of threaded aircraft fasteners—PLB-22 precision indicating washers, simple mechanical devices for accurately preloading the new high strength bolts. For detailed information about these products—or about your special aircraft threaded fastener problem—write us today. Aircraft Products Division, STANDARD PRECISION STEEL CO., Jenkintown, Pa.

AIRCRAFT PRODUCTS DIVISION

STANDARD PRECISION STEEL CO.



JENKINTOWN, PENNSYLVANIA

EWN-22 is much stronger than conventional aircraft belts. These curves, with ultimate tensile strength in pounds plotted against bolt diameter, show that it is feasible to replace an MS 20004 belt with an EWN-22 one size smaller. The EWN-22 is stronger in shear and in fatigue as well.

AVAILABLE WITH: April 15, 1957

Coldwellers are using it in their upper zone CI-185.

Arming missiles using R700 are the Atlas, Righton II and Thor.

Still another use, according to company officials, will probably be on the Convair F-106 Delta Dart fighter. This is the first aircraft to use Teflon hose.

The reason, which sounds that Teflon hose is hard or in Concorde, mainly, is because it is safe to qualify R700 hose to British standards.

Use of Teflon hose is not restricted to high value systems. It also is popular in rubber hoses at early bridge scientific devices such as vibration analyzers. Reason is that the Teflon inner tube, unlike rubber inner tubes, does not tend to expand when hot or the reverse side of expanding glass when the CTD change in heat. Result is that a smooth sheet, when coiled, was often coiled around the Teflon hose for the lifetime of the device.

A new one, Wright Air Development Center guided DDE (infrared) developed equipment approved by Rosello.

On all these engines, the hose is used to transmit hydraulic power to the 100,000 psi afterburner control arm actuating mechanism. In those applications the hose operates at 3,000 psi and heat at continuous temperatures of 350°F, rising to 400°F during start-down cycles.

In addition, on GE's J79, the hose is used in the hydrodynamic carburetor which uses the logic of the older combustion chamber. Pressure is 3,000 psi and heat at continuous temperatures are about 250°F to 350°F.

An very popular harness faster, lead, which had been confined to the powerplants, now goes out of the engines and begins to invade the whole aircraft. One of the first was attached to the inboard motor.

For this reason, R700 is used in vari-

ous lead-out wires for spurs on in-

ports all very important strength, plus a number of splices.

Superiorly Stable

Rosello's cites these strengths in the superstable stable which are not found in R700 hose: the entire Convair Super 80, Boeing fighters F-100, F-102, 104, 105, 107, and 108, which Rosello says, uses R700 exclusively. Company says the Navy's new F-4H fighter's hydrostatic system was designed around the use of high pressure Teflon hose. And the

fix-hose assemblies to be used with all automatic opening bay belts or sets of the like, assembled them in place. However, the Concorde specified that, until a Government letter specification is issued and a qualified producer has been selected, no automatic opening bay belts are still required to obtain approval from the Aircraft Laboratory, WADC. For the specific use of Teflon hose as umbilicals with automatic opening bay

Making R700

Rosella's is making double bonding R700 in three sizes— $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ in. (1, 2, and 3 mm. in outer diameter, respectively). The company is also making hose eigenstrains in the -32 to 111 °F use with triple bond construction.

R700 is a $\frac{1}{2}$ in. \times $\frac{1}{2}$ in. \times $\frac{1}{2}$ in. inner tube called a liner. It is covered with a radiation-shielding jacket that has heat resistance to 500°F . A new one, Wright Air Development Center guided DDE (infrared) developed equipment approved by Rosello.

A new one, Wright Air Development Center guided DDE (infrared) developed equipment approved by Rosello.

The $\frac{1}{2}$ in. size has an added carbon steel jacket to give the additional strength needed for the relatively long distance hose.

Rosello engineers say that at first they had a slight problem with leakage at the end fittings. This developed a secondary seal for the fitting which involved the jacket being cut to fit the fitting.

After the first few tests, he had a small leak at the VHL-14-5142 with the temperature raised from the standard 1200 – 1600 to 4000 degrees to Rosella's specification. The tests were implemented with test methods by WADC's Aircraft Laboratory at 4000 and 5000 psi. Company points out that passing these tests does not constitute final type approval of the hose because no specification rel. exists for such tests at the temperatures indicated.

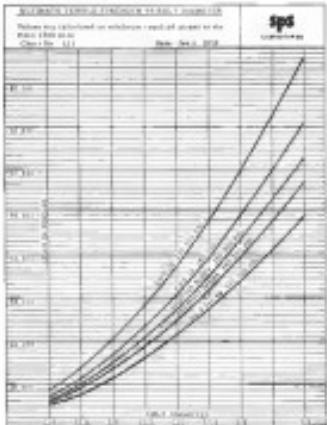
Rosello says that his R700 hose is good for continuous use at 4000 degrees to 1600 degrees. Company believes it will be able to raise the maximum heat to 1700 °F. Plans are now under way to qualify the hose for Class I hydrostatic system which heat temperature limit is 3 to 1000 °F.

As engine exhaust port set, R700 will operate satisfactorily for 10 hr at 1700 °F, this may represent about 100 hr of aircraft operation, since two



Build stronger, safer, lighter airframes with new SPS Hi Psi aircraft bolts

EWN-22 belt is greatly more efficient than conventional aircraft belts with increased bearing area, greater bearing without limitation of belted surface. New Hi Psi thread form, greater fillet under head, smooth overall surface increase tensile and fatigue strength. The EWN-22 lockout was designed with characteristics specially suited to the belt.

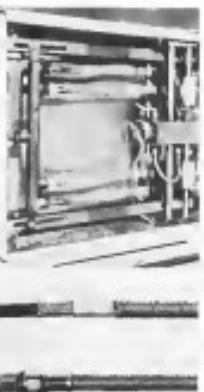


AIRCRAFT PRODUCTS DIVISION

STANDARD PRECISION STEEL CO.



JENKINTOWN, PENNSYLVANIA



R700 HIGH pressure hose being vibration tested (above). Hose construction shows Teflon inner tube, first wire braid, Teflon outer, second wire braid.

**UPPER ATMOSPHERE
RESEARCH**



The International Geophysical Year is a period of intensive research devoted to the earth and its surroundings. Aviat-Général research methods and play a vital role in IGY. In addition to Project Vénus great precision systems, various will supply its French Aerostat to rockets for precise research flights from Redstone.



Whether your interest lies in Project or not, Aviat-Général offers a variety of challenging assignments:

- Mechanical Engineers
- Electrical Engineers
- Chemical Engineers
- Electrical Engineers
- Aeronautical Engineers
- Civil Engineers
- Metallurgists
- Chemists
- Physicists
- Mathematicians
- Technical Editors



With Director of Scientific and Technical Programs, Basile 2846, Rive-Droite, Paris 16^e, Sèvres,
France.

to measure orbital operating life with high speed and constant speed and thermal load. And 100 to 200, be the expected life span of the reference.

In at least one engine application, K708 has operated satisfactorily for three hours at an ambient temperature of 73°F with 4250 ft-lb rating through it. Research officials claim.

Companies also plan to test K708 to 6,000 psi. Purpose is to determine whether the heat will withstand 4,000 psi and, if so, for how long.

Point of Controversy

AVIATION. With a series of high pressure tests Toulon has announced a controversial measure concerning the construction of larger aircraft above -5 sec. It has

resulted in belief that its standard double-braided construction will operate satisfactorily under the impacting inherent in 3,000 psi aircraft lightning system. The company's double braided system is being tested in such -5, -6 and -8. The -22 test also is being run in Comair's B-58, but this has to be triple

Designation Change

Resolves to drop the T profile on the -4 and -6 since most the company feels that these two were have been fully proven. The N will be dropped from after high pressure tests since only at such are completed a test program complete that gives in the two smaller sizes. However, the Y designation will continue as we see how it continues to function after the letter size has specified two.

braided and as operating time is located.

Aeroprop Corp., Jackson, Mich. disagrees. A company official told AVIATION Week that starting with the -5 sec, (possibly with the -6) and larger, double and even triple-braided construction will not be satisfactory. Reasons is that braiding the strands creates them and the resulting of the braids to sustain load under 3,000 psi must



Fuel Cell Development Lab

This hot and cold room is part of a new \$1 million fuel-cell development laboratory recently completed at B. F. Goodrich Company's Los Angeles, Calif. plant. Photo shows a technician feeding a Bechtel B-52 fuel cell stack test in preparation for hot and cold tests which are conducted at temperatures ranging from 165°F to -85°F. Hot and cold rooms are designed to test the solar and nuclear materials used in fuel cell construction. Other test facilities in the lab include two smaller cold chambers for development testing which can be brought to -196°F in cold test. Equipment for the rooms includes a shock table capable of handling a 40,000 lb load for testing the stability of fuel cells to withstand fuel surge pressures; a vibration table capable of vibrating 2,000 cps at an amplitude of 1/8 in. each; a variety of acoustic and flex tester and vibration oven and other apparatus to evaluate performance of new materials to 930°F. Facilities can test high energy fuels.



Globe Aerostatique...1783

Montgolfier's vanguard project

A sheep, a duck, a rooster—the first payload carried aloft for atmospheric research. Louis XVI, his queen and his court, were astonished witnesses as Joseph Montgolfier's smoke-filled balloon rose in majesty 1500 feet over Versailles. The passengers? Unharnessed (except the rooster, clucked by the sheath).

Project Vanguard, 1957, is an equally momentous "first"—an attempt to place a 21-pound satellite in an orbit 300 miles up.

Aerofit-General, designer-builder of the famed Aerobee-Hi, will supply vital second-stage propulsion systems for Vanguard launches during the International Geophysical Year.

Aerofit General Corporation

A Division of THE GENERAL ELECTRIC COMPANY
MILITARY AND SPACE DIVISIONS, CLEVELAND, OHIO

Aerofit-General invites scientists and engineers—men of imagination and vision—to join the attack on the most significant research, development and production problems of our time.

Vickers Servo Pump Systems

Provide rapid and accurate response to minute electrical or mechanical signals.

The Vickers Servo Pump Unit shown at the right is a signal-controlled, variable delivery, positive displacement, reversible, low oil hydraulic pump. It consists of a servovalve or servo hydraulic motor, a pump, a servo-controlled hydraulic transmission for coarse control operations and hydrostatic servo valves.

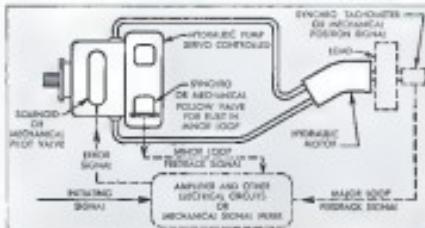
The servo transmission may be considered as a power amplifier when viewed from the electrical signal input, of about five watts, to the mechanical power output of several thousand watts. Various types of transmissions have been built, having output capacities ranging from one to four hundred horsepower.

The servo transmission may be considered as a power amplifier when viewed from the electrical signal input, of about five watts, to the mechanical power output of several thousand watts. Various types of transmissions have been built, having output capacities ranging from one to four hundred horsepower.

Any type of prime mover of sufficient capacity can be used to drive the power input — electric motor, auxiliary driver, fuel cell or an aerospace engine, air turbine, hydraulic motor, etc. The maximum constant speed is desirable.

Variable Pump Volume Controlled by Signal

Heart of the servo pump unit is the Vickers Variable Stroke Hydraulic Pump. This is a rotary, single-cylinder pump housed in a piston-controlled body. Varying the valve angle varies



SIMPLIFIED DIAGRAM illustrates a servo control system employing Vickers Servo Pump Unit and Constant Displacement Hydraulic Motor. This system accepts control signals from an electronic computer or other source, and generates control signals with feedback signals from load, such as extended stroke or direction, and voltage of fluid pumped to actuator; controls the load as required. For solid servos and servotilts, a linear input producing signals proportional to rate of flow may be used. This may either be a direct signal from a transducer or a signal from a servomechanism, such as varying the flow as a function of the rate of rotation of the pump or motor in a servosystem which feeds a signal proportional to flow rate into the regulator. The controlled output may be either a function of the position or velocity of the load.

with no intermediate valving, to the position or rate of linear motion. The feedback signal, indicating position, provides torque directly proportional to pressure and speed directly proportional to flow rate.

High Power-to-Weight Ratio

The servo pump unit and its associated hydraulic motor are designed for high power-to-weight ratio, high torque-to-inertia ratio, low inertia of rotating parts, and high maximum frequency.

Small Errors
High power-to-weight ratio— 13 hp/lb (motor only)
High torque-to-inertia ratio— 2.5 lb-in/lb (motor only)
Low inertia of rotating parts— 0.02 lb-in sec^2
High resonant frequency— 100 cps (motor only)

Other advantages are reliability and versatility of application. The various,



inherent speed changes and ability to hold position against any resistance in load are additional reasons why this unit is a desirable source which can satisfy design problems.

Inquiries under the applications of Vickers Servo Pump Units are extremely fast and accurate positioning of gas turbines on aircraft. Another application of the exhaust nozzle for jet engines is the servo pump's characteristic of providing at all times only sufficient power to meet the maximum demand, maximum the power law and therefore the best rejection of the greatly reduced average pressure level in this type of system problem. The life of the pump improves the reliability of all components.

For further information, ask for Bulletin ME-15 or ME-18 or get in touch with your nearest Vickers Aircraft Application Engineer. He can arrange for an engineering team to consider your problem and propose an optimum solution.

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Teflon Troubles

Reuter, which developed its own method of extruding Teflon wire extruded here in a product called Flexite, was faced with a problem in November, 1955, when an existing customer started producing his own total instead of ours. Production was shut down immediately, in December, 1955, by Reuter, Inc., while the trouble was being investigated.

Dr. Paul Reuter, head the blank, one of the new materials for the Tribofusible-type resin. Essentially, the fault of the important lay as he brought made prior to before



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WELDING PROGRESS REPORT

Leading Aircraft Subcontractor Proves Job Shop Economy of Seiaky Counter Weld Control

Electronic Welding Company of Los Angeles, California has now completed over eight months production experience with the new Seiaky Predeetermined Electronic Counter Controlled Resistance Welder. Their experience proves that the advantages of the new Seiaky welder already prove so high production savings and results in job shop "economics."

Ease of Set-Up Is a Key Factor

Mr. George Palmer, President of Electronic Welding Company, sums up his experience when he says: "The new Seiaky welder creates greater delivery advantage or the R.C. buyer. We get general ease of developing and repeating a cold set-up, including those requiring refurbishment in accordance with MilSpec."

Versatility is Vital for Job Shop Operations

The versatility of the Seiaky Predeetermined Electronic Counter Controlled Welder makes it the logical answer to Electronic Welding Company's requirements. Complete set-up minimizes the need for long, tight skilled labor. Its availability for aluminum, steel, stainless, jet engine alloys, brass, etc., makes it a part of the use of the machine on both aircraft and non-aircraft work.

At Electronic Welding Company, a single Seiaky spot welder is used for work on the J-3 program and for various structural in the F-104 and B-52 programs. Current usage is two ten-hour shifts per day.

Mr. Palmer states that "Having a Seiaky Predeetermined Electronic Counter Controlled Welder is almost prerequisite to getting maximum down aircraft and jet engine manufacture and enhance con-

trols what they set on the welder. The machine can do more from its setting and it is consistent throughout the entire range of production."

To prove his statement, Mr. Palmer has placed orders for two more of the new Seiaky Welders. One is a spot welder, the other a seam welder.

Production Advantages

Important to all who require safe, economical welds is the price comparison made by the new Seiaky Welder. Their report that they get



ELECTRONIC WELDING COMPANY'S new Seiaky Counter Control Welder. It is shown here welding an afterburner duct for the Pratt & Whitney J57 jet engine. Note the no production use of a brush-welding welding method.

Largest Manufacturer of Resistance Welding Machines in the World

SEIAKY
Seiaky Bros., Inc., 4935 West 67th Street, Chicago 38, Ill., Indianapolis 7-5600

Teflon Toxicity

Teflon has been accused in some quarters of giving off toxic fumes when heated to temperatures above 400°. Resistorless fuses, however, from Wright Av. Development Center, Army Material Laboratory

This information contained in WADC Technical Report 54-801, Teflon does not give off toxic fumes at temperatures below 300° (STP). But it does at temperatures above 375° (STP).

gerous Teflon fume, has been used by Goodrich to manufacture the product.

Flex-O-Tite, Inc., Melville, N.Y., has been accused in Resistorless fuses of being the fume and is in production on the smaller sizes using Goodrich fume.

Stowaway, Inc., Fort Worth, Texas, also will produce fuses using Goodrich fume and its own fittings, according to Resistorless.

At the present state of the art, discussions appear to be focused on heat-resistant materials, specifically around HAF, Resistorless, silicon carbide. The only substitute on the horizon appears to be rigid metal tubing appropriately lengthened or spliced to allow a certain amount of flexing between the two ends.

Resistorless, which already prefers much metal tubing for its current heat assembly, is intensifying its interest in this type of plumbing.

Resistorless fittings have these advantages when used with relatively inexpensive rubber hose:

- **Fittings**, being the most expensive part of the assembly, can be saved and reused when the hose were cut or broken.

- **Fittings** can be replaced when flexible hose, because of its limited shelf-life, has to be discarded.

- **Leakage** and resistance problems are greatly simplified because hose and fittings can be bent into the field as built. Hose can be cut to length and fittings assembled at afield without the expense of straight hose assemblies of various lengths.

- The cost has changed with the advent of Teflon hose, says Resistorless. Now it is lower.

- **Hose** other than the fittings, is not the most expensive part of the assembly.
- **Flex** costs of Teflon has influenced shell life so壳 life needs to be discussed.

- Permanent couplings are required in many cases by rigging specifications who want to eliminate the possibility of individual servicing by inexperienced personnel.



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Engine test exhaustors. One of several tandem-disk centrifugal gas exhaust sets in an engine aircraft engine plant.



Ram air compressors. Two axial compressors driven by single motor are installed in a transonic aircraft plant. Allis Chalmers builds all types of axial compressors for small to large wind tunnel installations and other applications.

Altitude simulation and decompression testing with vacuum purge. This long line of single-shaft rotary units is installed in an altitude test laboratory in the Midwest.



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CAA Evaluates Lights To End "Black Pit"

Andrews AFB, Md.-Evaluation tests of high density runway lights developed by Civil Aeronautics Administrator James T. Fyle as the "ground component of an all-weather navigation system" will be completed May 1.

In a recent series of simulated IFR approaches and landings conducted with Fyle as the controller, three types of runway lights designed to eliminate the "black pit" illusion were demonstrated.

Experimental flights using the three types, all of which were provided by Sylvania Electric Co., began last January following the successful cancellation of the system. Distance at which the three systems will be adopted will be made by CAA around May 1 after four contracts have been evaluated.

Three Configurations

Two of the systems differ only in configuration:

- First type consists of Eltika bars of light at least along the last 5,000 ft or runway or 100 ft intervals. The main lights are located 30 ft from the centerline end-of-taxiway.
- Second type calls for an arrangement of the same number of bars 45 ft from the centerline.

The Eltika runway lights were originally developed by the Dutch and have been in regular use at Amsterdam's Schiphol Airport since 1955 (AW Jan. 18, 1955, p. 21).

In this arrangement, each fixture is mounted in a base bar in contact with a protective grid and buried back to the runway surface. The experimental lights at the Andrews Field installation are not yet finished but are set to repeat the runway surface in houses fitted with their fixtures that simulate the back-to-back triplex.

The third system at Andrews includes a 750 ft continuous strip of very high output fluorescent tubes on either side of the runway, beginning 80 ft from the threshold.

The lights form the complete runway surface and pack up strip markings at turn-around point and alternate white/crystal.

This system has not yet been thoroughly tested under actual runway conditions and there is some question as to whether glass tube lighting may eliminate it as a possibility.

The fluorescent tubes have a 415 volt, three-phase power requirement. Each tube is a 400-watt tube, 20,000 candlepower produced for each eight ft of length of the system. Total consumption is 70 kilowatts.

CAA believes that this type of runway light will be effective only on a black asphalt paving since reflecting glaze may be reflected by white concrete.

Closed advantage of the system is that only slight runway modification is required for installation.

Eltika Installation

Introduction of the Eltika lights probably will be confined to new runways since installation of the bars will not permit runway work until the new construction work is being done and affixing the buried bars ends.

The Eltika light is a 250 watt, IFR.

vs. 114 watt lamp. One lamp is located in each end of each, for expanded purpose, emissionelles to provide a general beam and specific intensity source.

Jerry Horning, project engineer of CAA's Technical Development Center in conducting the tests. Administration Fyle says he is convinced that CAA has "the answer" to the "black pit" problem in any of the three lighting cases. He added that an improved landing system that provides for automatic guidance to automatic ground control approach, will permit the CAA to choose the 200 ft. on-hold takeoff visibility minimum at airports where the best of these systems is installed.



ONE SYSTEM of runway lighting lights under test by CAA has been spaced 10 ft. from runway centerline. In operational use, lights would be set 80 ft. from runway.



SECOND SYSTEM a similar except that the bars are spaced 45 ft. from runway centerline. Backed by Sylvania, the Eltika runway lights originally was developed by Dutch.



THIRD SYSTEM consists of fluorescent tubes with high output along runway edge. Light reflects on paved strips, but is better on black surface than white concrete.

New Vertol helicopter seats 19 passengers, doubles as freighter

For the first time, a large capacity helicopter, the Vertol 44, is available to commercial operators. And it comes with a selection of options suited for airline operation, executive transportation, or charter passenger freight use.

Based on the design of the famous Vertol 31-31, which has been flown more than 100,000 hours by the military services of the United States, Canada, France and West Germany, the Vertol 44 offers the reliability and cabin capacity long lacking in civilian helicopter operations.



Cabin layout shows 18 luxury seats in Vertol 44 cabin version.

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airline operator product spans passes and require that each routing be compensated for the longer air route propagation path. Cytre, which operates solely from ground wave, does not encounter this problem.

Cytre originally was called Cyclops, a contraction of Cyclo-navigational Loran. When the designation was later abandoned, several proposals were put forward. As it came out, the name was changed to Cytre.

If the USAF has plans to make tactical use of Cytre, there have not been disclosed. Specers holds a contract to set up a Cytre chain along the East Coast which will be used by the Coast Guard and the Navy for undetected purposes. Like Loran, Cytre can provide navigation service in adverse ship

Airborne Equipment

In fact Specers has built only experimental Cytre receivers which included classified functions not required for civil use. Palmer estimates that as an initial matter for civil use a system of automatically processing security features in Cytre, such as the use of pseudorandom noise, would be sufficient to prevent jamming.

Smith's system would not detract in dramatic fashion. Pilots would have to read time difference information, then refer to special Loran-type charts to determine position. However, he says additional 20 pounds, automatic plotting and display of current position could be provided, Palmer estimates.

In domestic Common System applications, aircraft operators probably would want upon the fully automatic display provision. This would place Cytre at a realistic weight disadvantage compared to present radar, airborne Cytre equipment.

aircraft including DME strength, and at a sharp disadvantage for pilots since they are not yet a 10 pound VOR receiver. Pilots say it may be possible to build a lighter weight Cytre receiver for private flight with somewhat reduced accuracy, but given no weight advantage.

Loran, Cytre Fundamentals

Both Loran and Cytre operate on the basis of the following principle. If one ground station transmits a pulse of radio energy, followed by a fixed and known time interval (TD) later by another pulse, transmitted from a second ground station located some distance away from the first, then the two pulses will be received by a receiving vehicle with the same time spacing (TD) if the vehicle is located at an equal distance from both stations.

If the vehicle is closer to the first station, called the "master," the time interval will be greater ($T + \Delta T$) if the vehicle is closer to the second station, called the "slave." The slave location can be determined if the time interval (ΔT) is less than Cytre's TD, meaning the spacing between the two stations and comparing it with the known interval at the time the pulses were transmitted. The airborne receiver determines the vehicle's line-of-sight position by periodically sending out short local pulses or "pings" to the two stations.

If another pair of master pulses are transmitted by a second pair of stations at least one of which is at a different geographic location from one of the first pair, the time interval between receipt of three two pulses establishes a second position.

Interaction of these two lines of position on a Loran-Cytre chart represents

the vehicle's position. If a third pair of stations are available, they can provide a third line of position to disambiguate the vehicle's position further.

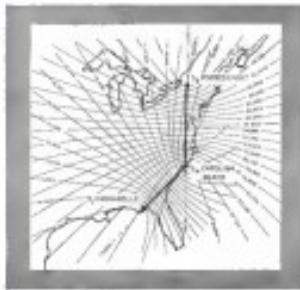
In practice, a single master station and two slave stations can be enough instead of three or three distinct pairs of Loran or Cytre stations. In such case, the master station also needs to be up with each of the slaves to transmit a pair of pulses in a time-shared sequence on a single radio frequency.

Pulse Spacing Measurement

One of the major hints on the accuracy of standard Loran is the panic with which the time spacing between pulses can be measured. Because the pulses can be distorted when so close, it is difficult to determine the time interval more accurately than to within one microsecond. It is impossible to give the exact position for one car in fact in the same way that it is difficult to give the exact position of the entire chain and the receiver's position relative to the stations. An ADC report says that typical Loran errors in depicting (using ground waves) average about 14 nautical miles per error.

The problem of measuring pulse spacing is more difficult at night when skywave, resulting from multipath reflection, may produce a spread of up to 20 picosecond pulses which can overlap the actual pulses from a coherent ground-station transmitter. This can make considerably larger errors in measuring pulse spacing. ADC's report says these range about 40 nautical miles.

Cytre, like standard Loran, requires

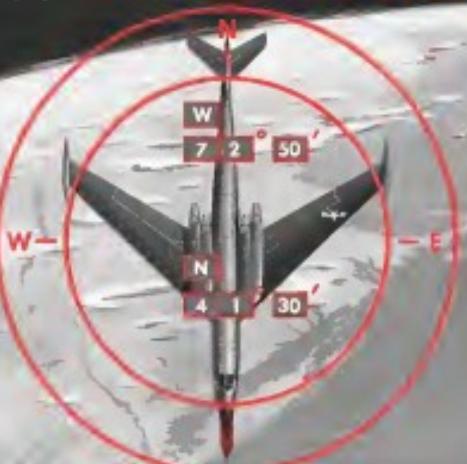


HYPOTHETICAL CYTAC system, or experimental test user installation (left) produced errors well within estimated values (right). Small figure alongside travel lines show estimated errors in feet. Actual errors experienced are shown at locations marked.



another example of how

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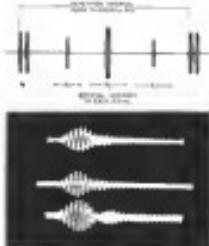
This significant contribution to jet navigation is typical of the work which Ryan and the military services are accomplishing in other fields of electronics research such as supersonic missile guidance for the Air Force and helicopter hovering devices for the Navy.

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COTAC PULSE sequence. Right, waveforms measured. Left, waveform at COTAC. At right, a time interval of 1000 cps.

that maximum time of each successive station encounter be minimized to allow constant and safe averaging between their pulses. COTAC in addition, requires that the respective RF carriers of the two stations also be synchronized. Synchronization is accomplished by ground wave signals between master and slave stations.

The COTAC measure distance pulse spacing in Trans-Indochina to obtain a rough indication, then refines it more precisely by measuring the relative phase of the RF pulses in the master and slave pulse envelopes. The rough pulse spacing measurement is made with sufficient accuracy to prevent ambiguity in the phase comparison process, i.e., to prevent complete phase of the first pulse of master pulse with the second cycle of slave pulse.

By combining pulse and phase comparison techniques, COTAC is able to measure pulse spacing to within 0.02-0.05 microseconds, according to Palmer. COTAC's extrapolated error is only a fraction of the total pulse error, the bulk of which results from variations in the velocity of radio wave propagation due to changing weather conditions. Sperry's Walter N. Dean told the IFR. With suitable compensation for the latter, COTAC's overall ranging errors are about 0.1 nautical miles, enough to use its command for a standard Long.

Sky-Wave Compensation

Sperry's tests indicate that the upper 30% range of a single COTAC beam could be extended from 1,500 to perhaps as much as 2,500 miles if sky waves were used. However, the system is designed to operate with known ground waves under normal conditions to avoid compensation from spurious pulses.

The first of any sky wave pulses nor-



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TEK-Electric Company

nally arrives at least 30 microseconds after the corresponding ground wave pulse. To avoid sky wave contamination, the Cyclic system is designed to provide a fast rising pulse whose amplitude is sufficient to permit phase compensation of its carrier or something less than 30 microseconds.

In an experimental Cyclic chain covering the Eastern half of the U.S., Sperry used pulse which rise from zero to full amplitude in about 30 microseconds, with the negative diagonal to position the phase-compensation approximately 21 microseconds after the start of the pulse.

At the low frequency at which Cyclic operates, fast rising pulses mean radio bandwidth. Cyclic occupies the full 30 microseconds allocated in the 90-110 kc band for navigation purposes, and about one per cent energy spills outside band.

Some observers believe that the 20 kc bandwidth requirement will cause D.C. bias measures extremely susceptible to atmospheric disturbance from Baudot stations. Naurac, which also operates in the vulnerable 100-110 kc region, is designed to use extremely narrow band techniques (AWP Apr. 26, p. 32). However Sperry engineers feel that more than a fair bit testing at the expense of full Cyclic utilization would be an unwise course.



BLOCK diagram of Cyclic receiver.

A major source of error in the Cyclic system arises from RF carrier phase drift due to delayed ground conductivity over different portions of the path between satellite and ground stations. Sperry found errors as large as 35 microseconds. Engineers also find a marked effect on apparent propagation velocity, particularly in the winter, Davis said.

Phase shift due to different ground conductivity appears to remain reasonably constant, showing a variation of less than one part in 50,000 over a period of a year, Davis said. This suggests the possibility of mapping the Cyclic service area to determine average

ground conductivity values or even then defining the Cyclic orbits to compensate for them, Davis said.

Sperry tests also indicate that phase shifts due to temperature changes are small or less than along the propagation path. This opens the way to automatically adjusting the time interval between marks and the return pulses to partially compensate for temperature phase drift.

Davis concludes that "it is possible to reduce greatly the long-term variation in propagation delay, making feasible overall accuracies of time difference measurements of the order of ± 0.1 microsecond."

Short term variations, due to atmospheric noise and interference, are considerably smaller than those aforementioned long-term variations, Davis said.

Time-Sharing Receiver

The sequential nature of pulse signals from different stations in a Cyclic chain permits extensive use of time-sharing within the receiver to reduce size, weight and complexity, Sperry's Barbara L. Cook told the IRE.

For example, a common RF amplifier is used, together with a 4-40 size antenna and a standard tricolor AGC device. The sequential signal amplitude and phase measurements are made almost independent of RF, using basically all single pass through the time circuits, Cook said. Timing circuits also are altered.



New VHF Receiver Weighs Only 10½ lb.

Celeri Radios, Inc.—New light-weight VHF communications navigation receiver for airborne and maritime aircraft use, which weighs 10½ lb., accepts a short 2 ATU air core and provides 30 kc channel spacing over the frequency band of 108 to 112 mc, has been announced by Celeri Radio Co.

The new Model 5100 is less than half the size and weight of its predecessor, the 5101, which required a more limited band (111 to 116 mc). Substitution of planar-mica devices

permits construction of a compact receiver offering the Celeri 10½ lb. weight for three times the power for three times the sensitivity.

Designs also indicate that the Celeri 5100 is capable of providing 100 watts of output power.

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...with new CONTOUR TRENTWELD

New Contour-Trentweld stainless pipe and tubing is so smooth, both inside and out, that you can't even feel the weld. It's stronger, more uniform, with no place for corrosion or erosion to get a toe-hold. And it's available in any size or gage . . . in all stainless, high-alloy, Elastelloy and titanium grades that can be welded.

**CONTOUR
TRENTWELD**

**Stainless and High Alloy
Welded Tubing**

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST ROTH, WISCONSIN (subsidiary of Crucible Steel Company of America)

for tubes and the use of a transistorized detector in a one-quarter section of the foundry makes inspection portable, responsible for the size and weight savings. The new apparatus uses 9 tubes, 3 transistors and 7 diodes, plus components for 19 tubes for its predecessor. In addition, the portable computer system weighs only the 100 to 150 pounds; the 12VDC, when used with a Collie 7400-1 navigation computer, runs on 12 volts. When combined to a sheet 4 AVR and weighing about 12 pounds, provides

•ILS Location service, at odd north-south-equals from 105.1 through 111.9 mc, with simultaneous voice reception

•Omni-range (VOR) service between 102 and 116 mc, with voice reception

•TWR service at even north-south-equals, with 50 to 120 steps from 80 to 112 mc, with voice reception

The new system is crystal controlled for full 106 to 155 mc coverage and can be supplied with lower crystals if only 108 to 136 mc service is required.

The antenna is designed in Antennalite Radio Inc. Classmate 523A, and meglofus module construction throughout.

FILTER CENTER SERIES

►**Gaffer Spacemaster PWT Research**—One research emphasizes the transition phase of the overall process was significant in solving problems that have been launched by Gaffer Radio Co., a small university and research center.

►**New Type Amplified**—Consolidation of two solid-state phenomena—electroluminescence and photoconduction—provide an exciting new tool

input for controlling doses of electric current, according to Dr. Michael J. Heile of General Electric Research Laboratory. Solid-state semiconductor materials emit light when current is passed through them. Light intensity can be converted back into electrons, which in strikes at adjoining photoconductive small counter attached to one of the two conductors could provide good type control. Heile also specifies that photoconductive portion light source ought to be "as big as getting closer to the theoretical 200 lumens from every watt of discharge instead of the 20 lumens produced in a good conventional bulb and 60 lumens from fluorescent lamps."

►**Changing Tapes And Name—Radar-Lithograph Division—Manufacturers Association (DLMTIA)** can now describe its name, as Electronics Information Association of Electronic Manufacturers Association. Originally called Radar Manufacturers Association, the



complex aluminum sand casting

for high
temperature
applications



Aerospace aircraft valve principle for sheet casting

This extremely complex aircraft valve body is currently being sand cast by Rolle in two aluminum alloys . . . 3557D and 3567B. But as part of a continuing program of casting research, Rolle has also poured the piece with equal success in ZREI and A-142. While A-142 does not yet have the acceptance of many other alloys, Rolle is extremely interested in its possibilities in high temperature applications.

The valve body is an ideal test piece for such research. Few castings offer a tougher trial of as-cast properties. The many small diameter passages through the piece demand intricate tube casting as well as the more conventional sand cores. The tubes are removed after casting by a process developed in Rolle's Research Laboratory.

Whether your needs are limited to conventional alloys and casting techniques, or demand unique experience in high temperature alloys, intricate tube casting, etc., you'll find Rolle as ideal source of aluminum and magnesium sand, permanent mold, shell, and investment castings.

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Marquardt's new production facility now under construction at Ogden, Utah.



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ROBERT L. GABLE *Executive Vice President*

is second in command at the Marquardt engineering-production team. With an engineering-business-administrative-educational background and more than 20 years' executive experience in the aircraft industry, Bob is one of the motivating factors in the rapid strides being made by the Marquardt team.

offering new opportunities to professional engineers

Freedom to pioneer — freedom to grow . . . these are the challenges and new engineering opportunities at Marquardt Aircraft.

Through these freedoms, Marquardt stands established as the leader in ramjets, "powerplants of the future."

Through these freedoms, Marquardt leads the way into advanced engineering projects.

These freedoms—pioneering and growth—see an individual as each professional engineer, as collective as the entire Marquardt team. Through them, Marquardt now offers new and unlimited opportunity for professional engineers in two of the West's most stimulating areas: At Ogden, Utah, in the heart of the Wasatch Mountain vacation area, Marquardt is now constructing a multi-million dollar production plant to produce supersonic powerplants for the Boeing Bomarc interceptor missile. And in Southern California's San

Fernando Valley, Marquardt professional engineers are involved in a major expansion program for design, development, and test of new ramjet engines, turbojet and ramjet engine methods.

If you are a professional engineer interested in the freedom to pioneer—the freedom to grow—for yourself and your company, we invite you to investigate the opportunities at Marquardt Aircraft today. Please contact Jim Dale, Professional Personnel, 16551 Saticoy Street, Van Nuys, California.

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Portable PA

Portable, two-position public address system, delivers 50 watts audio power, weighs only five pounds and operates from eight 115-volt batteries. Device has range of more than 400 yards and unusually quiet operation, according to manufacturer, Kino Engineering Corp., 2995 Middlefield Road, Palo Alto, Calif.

name was expanded when TV arrived on the scene. With the rising importance of the civilian and industrial electronic segment of the industry, it took its present name.

► **Bassett**, Eastern Ray Flight Division—Golden Rodder's newest Model FD-107 flight director system will be installed on Board Airways' four new Boeing 747s and nine Lockheed Electras and one Eastern Air Lines' 74 Douglas DC-8s and 40 Electras. New model has four-track character panel switches.

Microwave System Uses Tropospheric Scatter

Tropospheric scatter communications systems which operate in microwave frequencies (1.375 to 6.5 GHz) are finding their use in the usual UHF band, thereby making systems less vulnerable to enemy interception and/or disruption, has been developed by Phillips Corporation for the Air Force. System provides radio bandwidths for transmission of television or radio signals over a distance up to 700 miles.

System employs two 25-ft. parabolic antennas which provide a 14.4 dB gain and 0.1 degree beam width. That wide beam effectively helps disperse signals which makes transmission less susceptible to interference from aircraft in or near the beam.

Also used are frequency selective microwave amplifiers rated at 2,000 watts continuous power and a device which combines the output from two diversity sources without previous switching equipment to provide a 3 dB gain in performance.



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B. Ellis (center), head of the Propulsion Department, and his methods of accurate thrust control for a missile rocket with Dr. Haywo M. Kandilliye (left), propulsion staff engineer, and Andre P. Dugay, propulsion research specialist.

PROPULSION ACCURACY—a major missile problem

Controlling power output is but one of the major problems facing propulsion engineers and scientists. Important advances in this and related areas of propulsion are necessary to missile systems now in development.

Because of the growing complexity of problems now being approached, Propulsion Engineers find their field offers virtually limitless scope for accomplishment. The ability to perform frontier work is essential.

Engineers and scientists possessing a high order of ability and experience in propulsion and related fields will be interested in new positions now at Lockheed Missile Systems Division's Sunnyvale and Van Nuys Engineering Centers. Inquiries are invited.

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MISSILE SYSTEMS DIVISION

research and engineering staff

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CALIFORNIA

BUSINESS FLYING

New York Police Helicopters Save Lives

By Erwin J. Rothman

New York—New York Police Department helicopter operations underscored the value of sister wing aircraft as an effective life-saving and law enforcement measure for local government.

Several of them have been used thus far by Bell 47Js purchased by NYPD's Aviation Bureau. About a dozen trauma patients were treated last year alone.

Highly publicized in the local press, NYPD's little "Bellies" are shown in tandem to local New Yorkers in the department's ground-based patrol car.

High Regard

Although the Bureau's modest \$25,000 annual budget hasn't been increased over the past five years, total numbers of the high regard held by municipal officials for Aviation Bureau operations can be seen by the way the money is budgeted for flying, which is twice as much as compared to other roughly treated city expenses. For example, the NYPD's Aviation Bureau devoted to buying a Bell 47J, a medium aircraft, it spent \$10,000 apiece to purchase three new four-place Bell 47J Rangers. Standard price for the 47J is approximately \$63,750. With all of the equipment specified by the Bureau, its aircraft will cost approximately \$88,000 each, including taxes, letter class, insurance, power plant, approximately \$2,000 worth of radio and optics.

Nominal Bell representatives put per charter of a single 47J at \$2,000; a twin seat two-ship should have \$5,000 worth and three would require \$75,000 worth. This is based on a single cost, in effect, of approximately \$25,000 per hour that meets 75% of an 47J's capacity, or roughly for 47J operation, wide base engine and rotor blades.

First Delivery

First of the Bureau's three Rangers was delivered late in February, the other two were scheduled to be delivered in Cloud Business Field Base in Brooklyn this month. Of the two remaining 47Ds, one will be used for training and the other eventually will be replaced by a new model.

Ranger's improved performance with improved payload was the major factor in reducing the aircraft weight. Although the 47D is rated in the performance area as a light transport, Aviation Bureau safety in a two-plane step for its type of operation. Its new Ranger's with a maximum allowable gross of 2,565 lb., per-



FIRST OF THREE Bell 47-J Ranger helicopters purchased by New York police.



NEW MODELS will replace Bell 47Ds. Department will keep two 47Ds.

value a payload of approximately 950 lb. against the 47D's original maximum of 1,400 lb. more or less, with Bell working to increase the 47J's allowable gross weight to approximately 2,375 lb. maximum. Presently, the Bureau is along the way to getting a first stretcher of rotor overhauls. New York City, patrolling some 600 mi. of waterfront, it works with City Adminis-

tration Administration and Civil Aviation Board in checking complaints against New York, enforced regulations at Department of Motor Vehicles and Aviation regarding required bases and other licensing items in its production, and does a considerable amount of solid service, but remains City dependent.

An average day's breakdown of the type and number of flights in helicopter traffic include: including heavy in-



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distress 69, traffic, several 55, aerial photo service, 25, statistics for mining permits and bonds, 75, transport unpaid 4, suitcase breakers 15, status walking exercises, 3, mailing hours reported in traffic, 10, letters, 10, damage, 5, court awards, 1, apprehension of states loans with contingent 3, local voter laws, state 15.

Once the police helicopter assisted in apprehension of a band of kidnappers who tried to use corner pagans for do lewts of money ransom. The kidnappers ended the pagans to the kidnapper's hideout. Another fine use of the Bell cockpit helped narcotics agents nab a dope peddler who had avoided taking for train. Detectives pointed a mail on top of the suspect's car followed him in air to a parking lot, where the kidnapper parked to stand with the do.

Second, twice, passenger emerged from Webster Island have been killed by the

Fire Copters?

New York-Fire Fighting Laboratories Division will play a major role in Department operations in the future, P. S. Fire Commissioner Edward F. Conroy, Jr., told Aviation Week.

Commissioner Conroy has a need for a flying wing, "fire copier," large enough to carry about 10 firemen, 500 gal chemical tank specially developed lightweight houses with fog nozzles and heavier nozzles for attacking contact. Such equipment especially would be useful in confining burning areas and to fight spread or lesser fire difficulty to much over rough terrain.

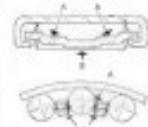
Small liaison-type helicopters also are used for firefights. The Department plans to spend in the near future \$100 million for new aircraft, other operations to be in the air, too. Commissioner Conroy and commissioners in his department have and borrowed Peiper Department Bell 47s on such occasions. Commissioner Conroy emphasizes that if his department had its own small helicopter it would be used for such duties at least four times a month.

However, such equipment doesn't appear to be in the procurement stage of present, the Commissioner says there is no room now in the department's budget for it.

Several helicopter manufacturers, particularly Bell, Kaman and Vertol, have started for liaison helicopters. Vertol and Bell have been working with local Cities and City of Atlanta, a liaison development based on its Model 47 and demonstrating how close the ropes can work to fire. And recently a sliding sheet is needed as the eye of lights-eight dispensing equipment.



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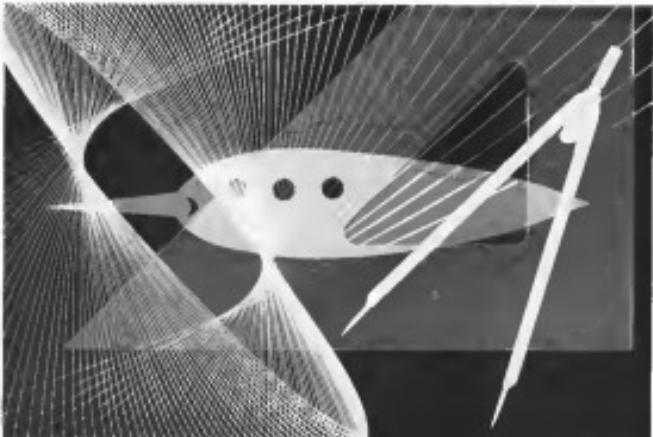
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Arnold N. Bravington, Jr.



John W. Scott, Jr., Autonetics Board of Directors, Vice Chairman of the Board. He joined Autonetics in 1951. Vice Group Director, he supervises and directs the company's business development and defense activities in Autonetics' home state of Southern California, where his career has included missile photography and space reentry.

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AUTOMATIC CONTROLS MAN HAS NEVER BUILT BEFORE

Low Flying Cessna 172	Board Loadings	Credits
1966	15	2
1967	45	8
1968	7	1
1969	11	7
1970	65	6
1971	11	3
1972	57	9
1973	21	9

helicopters maintaining surveillance over the island, forcing refugees to leave their boats and flee across land.

Traffic cones provide shielding from galaxies from the air. At night they are everything that might still traffic for more than five or ten minutes, they refuse to send patrol cars to the scene. Accordingly being a major source of traffic jams, the helicopters are engaged in photographing parking lots and areas, car parks, parking garages and ground areas. By the end of the year, the police will be able to spot the best places to build the lines of traffic in close range passage of bus vehicles and automobiles if needed, the helicopters would be called in to execute impound.

To assist in getting supplies to distant hospital, the Aviation Bureau developed an Emergency Medical trans-

porting aerial platform truck at an price premium of 20% of the city's largest hospital, each one comprising the aerial loading area subject to the limitation that would be imposed by a chapter.

Police also are developing a short the helicopter will cover one of the area's passes in case of trouble.

Policemen are trying to update their aircraft equipped by epoxies and have been used to fit blind plasters to strengthen cases. Sometimes they have gone out to locate drivers on fishing boats, dropping a note in the water alongside the boat to tell the driver he is greatly needed on a case. Occasionally the captain can't gather a party having left children, or goes over seeking missing persons.

Aerial Survey

The helicopters are estimated to have saved considerable in aerial photo surveys work for other departments. Officials estimate that thousands of pictures have been made from the Bell Glass major project was photographing the entire lower Mississippi in aid of cane cane as developing a new project. Glass views enabled them to evaluate breeding habits and calculate amount of pest that would be required. Other

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U. S. Business & Utility Aircraft Shipments

October 1-November 1957

Model and Model	New Month		Previous Month Billing Price	
	Units	Jobs	Units	Jobs
Aero Design 200-A	1	3	10	10
400	3	10	300,000	\$1,440,000
Beech 18-Berserker	17	60		
18-Twin-Berserker	2	18	3,125,574	3,044,221
18-Executive	6	10		
Bellanca 8-6	2	2	15,500	15,500
Champion 200-Banner	14	12	67,000	23,740
Champion C-1-Banner	3	9	81,000	84,000
Bell 20-20-Banner	2	2	45,000	46,000
Monterey 18-30	2	6	45,000	51,000
Fires-18-10-Twin-Turb	18	32		
18-18-Twin-Cab	40	40		
18-20-Twin-Cab	18	33	1,041,744	3,141,872
18-20-2-Twin-Cab	18	48		
Fires-18-18-2	1	1	16,000	16,000
Varo Royal 18-2	1	6	24,000	4
Total	477	180	17,351,742	\$1,163,246

¹ Two-week plant shutdown in February for model change
Source: Compiled by AIRTECH INC. from manufacturer's reports.

engineers:



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photo sessions are known for Board of Estimate to review land sites selected by engineer and also to study site for new schools and other public buildings.

To cover its territory, the Bureau works out of a hangar loaned from the Navy at Floyd Bennett. Aerial patrols start at 5 a.m. and last through sun down. In winter months, when daylight savings time prevails, this means the stops we make won't apparently be p.m.

Emergency Use

Normally, patrols are canceled if winds exceed 15 mph or visibility is less than three-quarters of a mile, but in an emergency police helicopters have gone out even when these conditions have been exceeded. Once, after a hurricane, they went out in winds of up to 50 mph to rescue two small boys who had ventured out into choppy water on their sailboat. The weather was so rough that all boats were tied up and the helicopter had a gopher launch that attempted the rescue from a distant point.

In the course of its operations, Aviation Bureau personnel have been awarded 15,210 department commendations for their work.

Five heliports, strategically located around the city, make it possible to have helicopters about five minutes away from the furthest point from each station; the mean time is about 25 minutes away from the furthest point in the Bureau's jurisdiction. All of the helicopters return to their base each night. Although the helicopters are equipped for night flying, this is avoided because of the difficulties of landing anything after sunset, except when a pilot makes a one-man landing at night flying annularly.

With five heliports, the Bureau is able to have four choppers available for duty at all times, the fifth being an overload back-up, put in service 50-60 hours a month. On the basis of operating costs average out at approximately \$800/h.

Low Overhead

Key to the low costs, of course, is low overhead. Pilots and maintenance personnel are underpaid officers from the Police Dept., with paychecks going to expenses. Flying rosters made up of 41 pilots and 33 maintenance personnel. Two over 50 on each patrol.

Recruitment for pilots who want to transfer to the Aviation Bureau is that they have at least a commercial pilot's rating; maintenance personnel have to have an AFM mechanics rating. Some 30-35 pilot applications and about half that number of mechanics are usually on file with the Bureau.

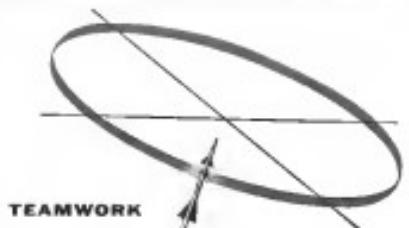
Aviation Bureau is one of three units

belonging to NYFD's Emergency Services Division commanded by Deputy Chief Inspector Walter F. Kistchak. The Bureau is in charge of D. Kenneth C. Johnson, an ex-CIAKAM instructor with the Training Command who taught midwives transport pilots to Johnson come to the Port of New York in a position in 1946, spent three years in the Army before transitioning to the New York City.

Bell straight through Lt. Johnson a sergeant, now acting sergeant and soon patrolman. Maintenance personnel is made up of a sergeant and 12 privates. Original group of pilots were trained at Bell Helicopter Corp.,

when it was based in Buffalo, N. Y., since then, new pitchers pilots have been trained at Floyd Bennett by Sgt. Harold W. Johnson.

Since 1948, Bell's training unit, now with considerable attention to emergency automation, spot and collision avoidance devices, the contracts between the Bureau is approximately double major helicopter manufacturers although the majority of those flying actually in our state are still flying smaller aircraft in our state cities during the metropolitan. According to Sgt. Johnson, Bureau pilots have never experienced a full power failure. Sgt. Johnson is in charge of



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CARL G. HOLSCHEH, President of Sperry Gyroscope Company.

"In the years ahead, the nation's requirements for new and more efficient weapon systems, delivered at maximum speed and minimum cost, will impose greater demands on industry. For its part, Sperry is moving to meet these demands with the formation of our new Air and Surface Armament Divisions.

"Objective of this product-team reorganization within the Sperry organization is to assure more advanced design, shorter lead times and lower costs in the development of weapon systems in these two categories. Each division, with its own engineering, manufacturing and contract organization, includes specialists in radar, fire control, gyroscopics, navigation, inertial guidance and all the allied sciences essential in the engineering of complex weapon systems."

C. G. Holschuh



SAMUEL Z. ASZKENASY has been appointed Manager of the Air Armament Division. Formerly works manager, Mr. Aszkenasy is now Associate general and design manager, Control office. His work at Sperry has included responsibility for computing, rangefinding, searchlights, antiaircraft gunners, radar and infrared development.

AIR ARMAMENT

Air-to-air missiles and systems
Air-to-surface missiles
Airborne radars
Airborne beacons
Airborne electronic countermeasures
Bombing-navigation systems
Aircraft fire control radars
Airborne inertial systems



MILTON B. LOCKWOOD, manager of the Surface Armament Division, was formerly a systems engineering director, A. West War II Lt. Col. of Artillery, and interim technical advisor at M.I.T.. Mr. Lockwood has been associated with Sperry projects in underway capsule fire controls, guidance computers for missiles, antisubcraft control systems and inertial navigation equipment.

SURFACE ARMAMENT

Surface-to-surface missiles
Surface-to-air missiles
Ground and shipboard search radars
Ground and ship tracking radars
Battlefield surveillance equipment
Motor and artillery locators
Land, ship and submarine fire control systems
Computers
Land and ship-based transmitters
Weapon direction systems
Ground and ship-based electronic countermeasures

SPERRY GYROSCOPE COMPANY
Great Neck, New York

DIVISION OF SPERRY RAND CORPORATION

The achievements of the McDonnell engineering team speak for themselves—the Air Force F-101 Voodoo, the Army XV-1 Convertible plane, and the Navy F-11 Demon.

M.A.C. is equally interested in developing outstanding engineers as well as superior air weapons. In addition to consulting and provision of tool assignments, advanced in-plant engineering courses are available, as well as supplementary training at two local universities.

Positions of technical leadership exist in virtually all fields of airplane, helicopter and missile engineering.

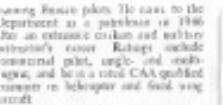
www.conference.org

**RAYMOND T. KALETTA,
TECHNICAL PLACEMENT SUPERVISOR
P.O. Box 206, St. Louis, Missouri**

MACCARTY'S SUCCESSFUL CAREERS

For additional information

MCDONNELL Aircraft 



Automatic irrigation have shown some results on winter, because soil training is a tricky procedure on land, calling for exact measurements to prevent to avoid damage. Rated plows also are checked every three months to avoid interruptions for periods of about two hours and half, causing no-go-off buildings on the surface of the water from 90 days, 180 day and 360 day into the end.

Spot landings for rescue work also are planned, pilots being required to touch down on flat areas or rock pinnacles extending about half the length of the helicopter's foot gear. In addition, rated pilots are checked out on how they have been advised for a PREMIER search.

Pennwest formally agreed to buy the Boreas, although cadbury has absorbed 10-15 smaller peers since it started boltzinger operations in 1948.

Switch to the new Model 47 J will approach five-hour flight limit for all B-52B pilots.

Do Slow Reading Habits "Tie You in Knots?"

Are New Patients Refused In
Our "Most" Receiving -
Low Grade Fibromyalgia,
Lumbago & Sciatica?
Are New Patients In
Treatment And Receive Only
Medication? Are They
Refused? Are They
Treated?

HOW TO READ MORE — IN LESS TIME!

An Easy Way to Increase Your Reading Skill and Speed . . . to Understand More, Remember More, and Use More of Everything You Read!

<http://www.bartleby.com/20/1000.html>

the first time in history that the people of the United States have been compelled to pay a tax on their property.

How This Book Helps You

we can have a Fair or two page about
the 1st of June, "The 1st of June" —
and make it a "memorial". — But I am
inclined — But I am inclined
to have a Fair now, and have a
Memorial at the 1st of June, —
which would be a good time.
— But I am inclined to have a
Memorial at the 1st of June, —
which would be a good time.

TRY IT FOR 10 DAYS FREE!

The new guide, *How to Buy a Home*, is now available at all branches of the Bank of America. Write for your copy today.

Considerable development is evident in the design and operating equipment of Scotch, complete include a multi-section cage stand, which simplifies loading and unloading, built from blueprints. But the British manufacturers' imagination goes even further. The British who designed and built its own mobile helicopter landing platform which speed getting the chopper in and out of the hangar and ashore.

The Bureau appears satisfied with its equipment. Some plug problems initially have been fixed through the use of 80 micron Shell TCP feed, which the Bureau has been using since the telephonem company asked that it be used on a test basis before it was more widespread. Plugs are now seldom changed between 15 hr. shifts; changes are made 100 hr.

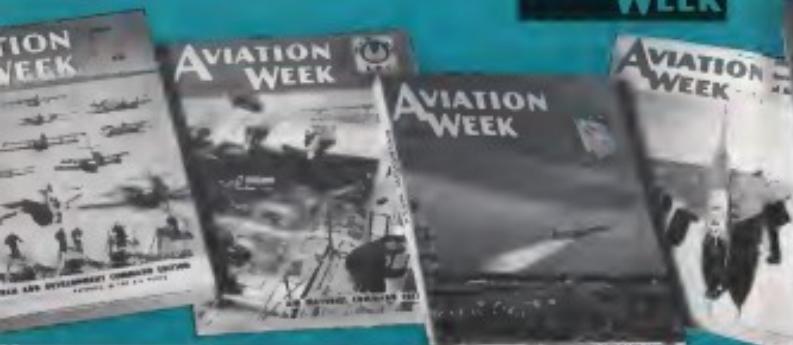
Another reported point of agreement

NOW! Get Extra Aviation Space Values at No Extra Cost

SCHEDULE THE **AVIATION WEEK**

RESEARCH AND DEVELOPMENT EDITION JUNE 3rd

A Guide to Airpower Progress



Need for Specialized Research and Development Information

Manufacturers are busy broadening their research and development activities. They recognize that their competitive position depends on the ability to compete in the urgent quest for new basic scientific knowledge in such diverse fields as geo-physics, aerothermodynamics, metallurgy, human factors and astrothermochemistry, etc. Because of the highly specialized sciences and technical fields concerned, manufacturers must often obtain research and development assistance from outside sources - government, university, scientific foundation, foundations and other manufacturers. In a sense, research and development has become a unique commodity that is produced, bought and sold.

Expansion of research and development procurement activities has brought the need for a Guide which will increase the understanding of procurement procedures and available facilities and capabilities. To satisfy this need, the Research and Development Edition, an offshoot of editorial pioneering in this field as outlined later in this announcement, will provide the following specialized research and development information:

INDUSTRY

Industry's vital and rapidly increasing role in research and development will be surveyed. Indeed guidebook section tells industry what

facilities and capabilities are available, where they are and how to utilize them. Information on the marketing of research and development availabilities will be reported.

Newly revised government research and development contracting policies and procedures explained in detail.

GOVERNMENT

Missions, organizations and operating procedures of National Advisory Committee for Aeronautics; Air Research and Development Command; and Office of Naval Research summarized. Their laboratories, research stations and test center facilities, capabilities and availabilities analyzed in detail.

UNIVERSITIES AND SCIENTIFIC FOUNDATIONS

Exhaustive report on the important research and development programs at work at various universities and independent establishments throughout the country. Particular attention is given to the procedures of sub-contracting these resources.

INTERNATIONAL

Extensive coverage of overseas' sources of research and development available to industry as reported by our Geneva, Switzerland office.

Pioneer Research and Development Coverage

AVIATION WEEK pioneered research and development coverage in 1953 when it presented an extensive full-scale report on the USAF Air Research and Development Command and the gigantic industry, military and academic production team that it coordinates. Thousands of extra copies were purchased by government, industry, university and foreign establishments and used as the standard reference for training research and development and procurement personnel.

In 1956, AVIATION WEEK was called upon to publish a second Air Research and Development Command Edition to report the many changes, improvements and advances that had been made. It is now in use as a current standard reference and training aid on research and development.

AVIATION WEEK's 26 full-time graduate engineers and aviation specialists located in key aviation centers throughout the world will provide the editorial manpower and know-how for this newest research and development service edition. Their extensive experience in this field which was pro-

nored editorially by AVIATION WEEK assures an information packed Guide of outstanding usefulness and survivability.

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Here is the organization devoted exclusively to electronics—with a broad background in designing specialised components such as electro-mechanized filters, resistors, and in using plated circuitry, modules and encapsulated components. Moreover—fully

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Positions open to qualified Engineers and Physicians



MOTOROLA

RECEIVED **RECEIVED** **RECEIVED** **RECEIVED** **RECEIVED** **RECEIVED**

are the SMT's regular salinity batteries, 55 ft. each which replaced former low salt Reptile-salient workings about 50 ft. Since the SMT's was established in Banana coveys in 1931, it has never had to change out salt battery (up to a massive 100 ft.) and it has never had a big stock with a massive regular salt battery. In fact, it sold operations West. He mentioned an instance where one of the Reptiles had sustained an attack and salt-battery was salvaged intact and later used.



EXCEEDED

by these 2 Resinite Sleevings

Just two offerings—one source—can supply all your needs for every grade of MIL-H-320C vinyl insulation. Resolute EP 100A and Resolute Hi-Flex 105A, not only meet every requirement, but far exceed specifications. Simplify ordering, notice inventories with these two fine Resolute offerings.



EP-69A for low temperature and general purpose use. Wide working range from -40°C to 100°C. Dielectric to 750 volts/mil. Corrosion, oil, fungus and flame resistant. #20 AWG through 21AWG. 10' 5 Standard colors, others available.



HI-HEAT 105A for high temperatures where outstanding resistance to heat and cold is required. For continuous operation from -210°C through 185°C (1000 watts/mil average dielectric). Exceedingly high flame, fungus and salt spray resistance. -210°C through 200°C. 0.11 standard colors, others available.

Write us your requirements and we'll submit samples and performance data on appropriate designs, types of lining rods.

American Begins Work

On Idlewild Hangar

New York-American Airlines is to give construction of a \$23 million maintenance facility at New York International Airport. The expandable 750 ft x 360 ft hangar is scheduled for late 1978 completion. It will accommodate 10 jet BAC-111s at once.

The facility will occupy a third of a 75-acre site about half-mile from Bell Padrony on the access road to Mynydd A 500-car parking lot will be built.

ANSWERING TO THE PUBLIC, April 2003

• 10

Resinite 
Health Division THE HEDREN COMPANY Chatsworth
Box 258, State Route 118, California



**Honeywell's Variable Inlet Diffuser
Controls Keep the "Hustler" Hustling**

**ENGINEERS
SCIENTISTS**

**WORK ON ADVANCED
PROJECTS LIKE THIS**

As much munition advisor, even farmland must be kept diffuse positioning before flight transversely.

But a final diffuser designed for optimum pressure at a given high speed number may be so inefficient at a lower mach number as to render it impossible for aircraft to reach design speed.

In the U.S.A.F.'s newest supersonic fighter, Convair's B-58 Hustler this problem was solved by Honeywell's variable inlet diffuser system—the most accurate known. They are automatically controlled to the proper parameters to achieve maximum pressure recovery and mass air flow matched to engine requirements.

The Challenges to Comet

Variable inlet diffuser systems are just one of 314 research and development projects in which Honeywell, Airtex is engaged. These projects are on the basic areas of:

ENTRICAL DEFENSE • FLIGHT CONTROL SYSTEMS • LIQUID BREMSEMECHANISCHE SYSTEMS • VISUAL AND INTEGRATIVE GROBES • DIGITAL AND ANALOG COMPUTERS • JET ENGINE CONTROLS • AIR DATA COMPUTERS • DRIVING COMPUTERS • TRANSFORMER AMPLIFIERS • INSTRUMENTATION

Each of these projects often encompasses several opportunities for capable engineers and scientists.

And Honeywell's equal growth creates jobs of early advancement. Engineering personnel at Honeywell Airtex has tripled in the last 5 years, to well growing faster than the aerospace industry average. Supersonic positions open quickly; are filled from within. The best way you start with us, Honeywell is just for start.

Write today!

To learn more information concerning these opportunities, send resume and application to: Bruce D. Wood, Technical Division, Dept. T-100, Honeywell, Inc., 164 New Boston Boulevard, Woburn, Massachusetts 01888.

Honeywell
Aeronautical Division

Certificates of Necessity

Washington—Office of Defense Mobilization has awarded United Aircraft Corp., Pratt and Whitney Aircraft Division's new Joint Beach Co., Inc. Facility a certificate of necessity for reclassification of instrumentation in the amount of \$16,775,000 for research and development with 75% of the amount allowed.

General Dynamics Corp., Convair Division, San Diego, was awarded a certificate for research and development in the amount of \$17,032,000 with 60% allowed. Other certificates awarded:

Aerospace General Corp., Rockwood, Calif., amount \$10,000,000 with 60% allowed; Lark Camp, San Angelo, military electronic components, 100% with 10% allowed.

Aviation Electric Co., Baltimore, Md., amount \$1,000,000 with 100% allowed; International Business Co., Modesto, Calif., military aircraft maintenance parts, 100% with 10% allowed.

Western Electric Co. Inc., Mountain States, N. C., military electronic components, 100% with 10% allowed.

Western Electric Co. Inc., Mountain States, N. C., military electronic components, 100% with 10% allowed.

Western Electric Co. Inc., Mountain States, N. C., military electronic components, 100% with 10% allowed.

Western Electric Co. Inc., Mountain States, N. C., military electronic components, 100% with 10% allowed.

Western Electric Co. Inc., Mountain States, N. C., military electronic components, 100% with 10% allowed.

Arco Aluminite Corp., 1900 E. 27th Street, military aircraft maintenance parts, 100% with 10% allowed.

Prudential Research Corp., Rockville, Md., \$100,000 research and development, 100% with 10% allowed.

Arrow Deco Aluminum Manufacturing Company, Inc., military aircraft maintenance parts, 100% with 10% allowed.

Bethlehem Steel Corp., Bridgeport, Conn., military aircraft maintenance parts, 100% with 10% allowed.

Clark B. Daniels Co., Indianapolis, Ind., military aircraft maintenance parts, 100% with 10% allowed.

McDonnell Douglas Corp., St. Louis, research and development, 100% with 10% allowed.

McDonnell Douglas Corp., St. Louis, research and development, 100% with 10% allowed.

AMC Contracts

Wright-Patterson AFB, Ohio—Fiel housing is a lot of unclassified contracts for \$25,000 and over in value to the Air Materiel Command.

Wright-Patterson AFB, Ohio—Contractor for the production of 100,000 units of the Air Force Advanced Radar System, Inc. Radar Corp. of America, Canfield, N. Y., \$1,110,000 for product development of all components and assembly.

Wright-Patterson AFB, Ohio—\$1,000,000 for production of 100,000 units of the Air Force Advanced Radar System, Inc. Radar Corp. of America, Canfield, N.Y., \$1,000,000 for production of 100,000 units of the Air Force Advanced Radar System, Inc. Radar Corp. of America, Canfield, N.Y., \$1,000,000 for the low rate early and final rate production of advanced radar system units.



WAITING FOR A CHANGE

Development of aircraft and aero engine design is a pattern of never ending changes and modifications. Increasing engine and airframe demands more strength in more and better parts. Example: There are about 1,300 machined parts in the F-100A. In the F-100D, improvements have added 500 more.

Higher power and speeds in the same size airframe call for improved elevated temperature performance in alloys for structures, forgings and fasteners.

The big problem has been the forgeability and machinability of the tough alloys used in the intermediate elevated temperature applications. But they're being faced. Carpenter is now producing uniform elevated temperature alloys of very high quality which consistently meet tough aero specifications. Their quality and dimensions also allow tightened forging tolerances, improved machinability and cold forming properties. Result: More accurate forgings with better finishes . . . fewer rejects . . . faster production.

Complete information on application, fabrication and engineering properties of these alloys is summarized in our new booklet, "Carpenter Alloys for Elevated Temperature Service." For your copy, drop a line on our Company letterhead. The Carpenter Steel Company, 128 W. Beau Street, Reading, Pa.

Carpenter STEEL

Improved alloys for elevated temperature service



ENGINEERS

experienced in the missile components
and gas turbine fields

SEND FOR THIS BROCHURE

YOUR TRIPLE OPPORTUNITY
AT
SOLAR - SAN DIEGO



GOT THE FACTS about Solar and your triple opportunity... and get them now! Solar currently offers an exceptional opportunity for you to advance rapidly.

A new creative engineering group is now being formed for a challenging new project in guided missiles. Many openings also exist in Solar's fast-growing gas turbine program. The growth potential is tremendous... with enormous rewards in advancement.

Another important advantage is that you don't get lost in the crowd at Solar. It is a medium-size company (2500 people in San Diego) that has grown steadily since 1957. Personal policies

are advanced, including a profit sharing retirement plan.

Another advantage at Solar is the pleasure of living in California's climate at its best. San Diego is warm and sunny the year-round, with spectacular recreational and cultural facilities.

To learn more, write to Louis Klein, Dept. E-158, Solar Aircraft Company, 2500 Pacific Highway, San Diego 13, Calif. Why not take advantage of our offer of your qualifications and education?



AIRCRAFT COMPANY

1000 Hillside Drive, Chula Vista, Calif. Telephone: 679-1000. Teletype: 417-5000. Job #112-001.

1. USAF AIR FORCE ENGINEER OFFICERS
Ordnance Research Center, Cleveland, Ohio
Development and conversion of
solid propellant and composite
missiles and related materials to Army
use.

2. USAF AIR FORCE Research & Development
Wright-Patterson AFB, Ohio
Part of the Air Force's total research and development activities to develop
new aircraft, weapons, electronic
systems, and materials systems. Work
involves research, development, test,
and evaluation of aircraft, weapons,
and electronic systems.

3. USAF AIR FORCE Personnel Support
Wright-Patterson AFB, Ohio
Responsible for personnel management
of the Air Force's personnel system.
Work involves personnel planning,
personnel selection, personnel training,
personnel promotion, personnel
compensation, personnel placement,
and personnel records.

4. USAF AIR FORCE Materiel Management
Wright-Patterson AFB, Ohio
Responsible for materiel management
of the Air Force's materiel system.
Work involves materiel planning,
materiel acquisition, materiel
processing, materiel storage, and
materiel distribution.

5. USAF AIR FORCE Personnel Support
Wright-Patterson AFB, Ohio
Responsible for personnel management
of the Air Force's personnel system.
Work involves personnel planning,
personnel selection, personnel training,
personnel promotion, personnel
compensation, personnel placement,
and personnel records.

USAF Contracts

Following is a list of selected contracts won by USAF and over 100 released by Air Force Contracting Office:

1. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase I, AFSC-10000, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

2. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase II, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

3. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase III, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

4. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase IV, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

5. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase V, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

6. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase VI, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

7. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase VII, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

8. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase VIII, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

9. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase IX, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

10. USAF AIR FORCE Contract No. AF-33(68)-10000, Phase X, AFSC-10000-A, AFSC-10000-B, AFSC-10000-C, AFSC-10000-D, AFSC-10000-E, AFSC-10000-F, AFSC-10000-G, AFSC-10000-H, AFSC-10000-I, AFSC-10000-J, AFSC-10000-K, AFSC-10000-L, AFSC-10000-M, AFSC-10000-N, AFSC-10000-O, AFSC-10000-P, AFSC-10000-Q, AFSC-10000-R, AFSC-10000-S, AFSC-10000-T, AFSC-10000-U, AFSC-10000-V, AFSC-10000-W, AFSC-10000-X, AFSC-10000-Y, AFSC-10000-Z.

JOURNAL WEEK April 13, 1967

AERONAUTICAL ENGINEERS

Do You Know That
Your Future Skills
For You Far
Enough? Application to
AIRCRAFT PROPULSION

AIRCRAFT NUCLEAR PROPELLION AT GENERAL ELECTRIC

Whether you are just now
out of school or you have
had considerable professional
experience, we have opportunities
for you in aircraft nuclear
propulsion.

General Electric will train
you for aircraft nuclear
propulsion.

• An aircraft nuclear power
plant engineer designs
and develops aircraft nuclear
propulsion systems.

• On-site technical support
is provided.

You can be the first aircraft
nuclear power plant engineer
in the world to design and
construct an aircraft nuclear
power plant.

These aircraft nuclear power
plants will be used in the
development of aircraft nuclear
propulsion.

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in aircraft nuclear power
plants.

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about aircraft nuclear power
plants, contact:

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Manager, Nuclear Power
Plants
General Electric Company
P.O. Box 1200
Schenectady, New York 12345

Or call 518-380-2200
or write to:

John W. Klem
Manager, Nuclear Power
Plants
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P.O. Box 1200
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If you want to participate in the growth that
most recent is a mark record in the recognized
environment, write GE to the area in which
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How You Grow At GE. Your confidence will be rewarded, and you
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sound confidential review. No reference check
without your permission.

GE locations:

□ Front page additional information
concerning the job described.

□ An additional information concerning the
area of:

NAME _____

CITY _____

STATE _____

JOURNAL WEEK April 13, 1967

HOW DO YOU GROW AT ARMA?

Through diversification!

In our recent developments, we spoke of the growth opportunities offered by Arma. Almost immediately, perspective engineers began writing us, asking for more information.

"How does an engineer grow at Arma—process?"

Our answer, in a word, is diversification. Arma offers one of the broadest programs of work diversification in the electronics field.

At Arma, an engineer follows a project from original design, right through final production. As a result, our engineers and scientists are exposed to many activities not usually found under one roof—activities into which they can grow, as their abilities and interests lead them.

Here are some of the areas—all examples—in which Arma contributes its effects in:

MISSILE CONTROLS & GUIDANCE and FIRE CONTROL

1. SYSTEMS ENGINEERING

1.1 Project Engineers

1.2 Systems Analysts

1.3 Design Engineers

1.4 Computer Engineers

1.5 Optical Engineers

1.6 Radar Engineers

1.7 Electronic Engineers

1.8 Structural Engineers

1.9 Materials Engineers

1.10 Electrical Engineers

1.11 Mechanical Engineers

1.12 Chemical Engineers

1.13 Industrial Engineers

1.14 Manufacturing Engineers

1.15 Quality Control Engineers

1.16 Production Engineers

1.17 Test Engineers

1.18 Assembly Engineers

1.19 Assembly Technicians

1.20 Assembly Inspectors

1.21 Assembly Operators

1.22 Assembly Supervisors

1.23 Assembly Trainers

1.24 Assembly Workers

1.25 Assembly Yield Engineers

1.26 Assembly Yield Inspectors

1.27 Assembly Yield Operators

1.28 Assembly Yield Supervisors

1.29 Assembly Yield Trainers

1.30 Assembly Yield Workers

1.31 Assembly Yield Yield Engineers

1.32 Assembly Yield Yield Inspectors

1.33 Assembly Yield Yield Operators

1.34 Assembly Yield Yield Supervisors

1.35 Assembly Yield Yield Trainers

1.36 Assembly Yield Yield Workers

1.37 Assembly Yield Yield Yield Engineers

1.38 Assembly Yield Yield Yield Inspectors

1.39 Assembly Yield Yield Yield Operators

1.40 Assembly Yield Yield Yield Supervisors

1.41 Assembly Yield Yield Yield Trainers

1.42 Assembly Yield Yield Yield Workers

1.43 Assembly Yield Yield Yield Yield Engineers

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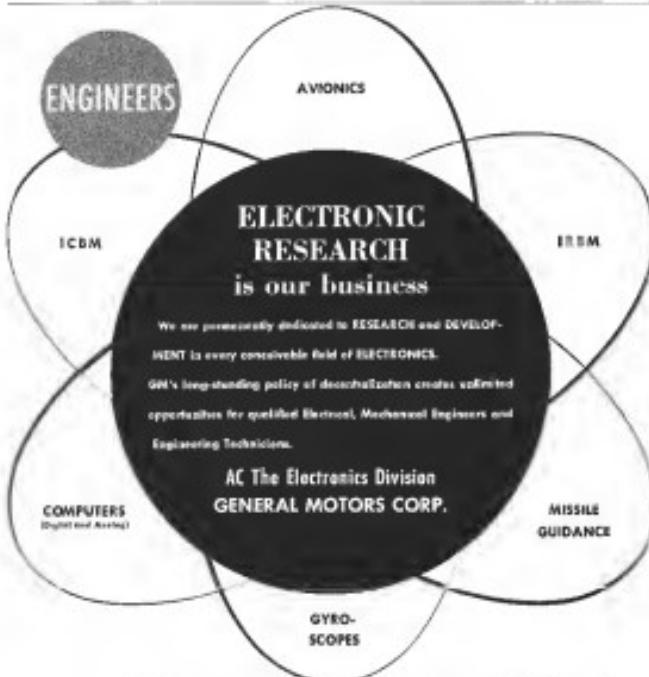
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Manned strato-balloon flights probe the mysteries of space

This is the Navy Project Stereo-Lab balloon that set a new altitude record as a secret agent at Rapid City, S. D. The fact that Commanders M. D. Rose and M. E. Lewis rose to 70,000 feet, the highest man has flown in a balloon, was considered

Of its more important was their development of a light, expandable suspension polyethylene balloon, with a payload carrying up to seven passengers, as a feasible means of carrying humans above the present limit of maximum sustained power flight. Modest flights to altitudes of 100,000 feet or more are possible today.

May have flown higher in a rocket plane, but only for seconds or less. Gossel

General
Mills

第11章
第11章

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ADVERTISERS IN THIS ISSUE

114 MATHEWS WEEK APRIL 15, 1971

ENGINEERS, SCIENTISTS

What did they say the last time you had an
IDEA?

At Discussion, we talk to hundreds of engineers, and many report how frustrating it is when they make a good constructive suggestion and are gently reminded that 'ideas' are the responsibility of others. (Strangely enough, these same engineers often talk about 'creative engineering' in their consulting work.) Fortunately this attitude is not typical of most progressive companies today.

We know many companies who encourage and appreciate creative thinking - who know that profit, innovation, and progress all go together.

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DECISION/INC

Publishers of the *Salterian*
Frances J. Bishop

FIND OUT ABOUT COMPANIES WHO
HELD YOUR IDEAS.

CONFIDENTIAL

Date:	Dec 19, 1967
Title:	Mr. John F. Morris, President
Name:	Management Consultants
Address:	3447 First National Bank Bldg Cincinnati 2, Ohio
Dear Mr. Morris:	
I do know good ideas, and I want to find out who needs them!	
NAME	
TELE <i>(in bracket)</i>	
CITY	
STATE	
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LETTERS

Suspension

If we consider of such circumstances as TWA's Capt. Leonard Speight (AW March 13, p. 30) who holds all the pertinent information, Capt. Speight's decision certainly seems reasonable. The other two indicators that he might endangere the lives of his own passengers and those of the people below the two planes. Other than having reason or reasonably heavy turbulence, it is difficult to conceive of any condition which would require a climb from 34,000'. It is even more difficult to imagine an emergency which would allow the pilot to make his climb to 34,000' unless the plane also has a reasonable vertical speed. Vertical airspeed has to go up or down at a rate of about 10% of the speed of the aircraft.

I agree with the ALPA that it is unjust to expand a license issue down to one that evades that the pilot has performed the task without fatalities. Certainly the above-mentioned transcript goes that evidence. However, I would like to add that the CAA has issued many of these transcripts along with requests of other pilots have the greatest respect for their ability. Even more than those above. I respect their interpretation which is as follows if I request an exemption from a regulation, I am responsible or at least very likely liable when they consider such possibility. The ALPA as a body is completely agreeing in fully when they manage to protect another from the natural and reasonable consequences of a decision they make in the cockpit.

Milwaukee Public
Non-Debtors Ex-

Danger Inherent

I have put forward reading the article concerning the actions of Flight Capt. Leonard Specht of TWY on Jan. 19 (AW, March 16, p. 38). The damage inherent to this candidate precludes me to submit so-and-so-and-so-and-so.

Under a normal emergency drill, in effect, Specht should have the hook thrown at him.

Some critics write as though the company

Some airline pilots are under the impression that they are God's gift to the traveling public. The existence of the ALPA is many times over does not help to alleviate this situation.

My basement requires a substantial amount of air flow, including occasional trips on TWA. If Spectre is typical of TWA's flights, then we'll assume that TWA will be off course flying 1st. Unfortunately it doesn't take very many Spectres to endanger all safety.

Address: Frank polishes the surfaces of his readers as he carries round at the magazine's editorial columns. Address him to the Editor, *Scientific Week*, 100 W. 42 St., New York 36, N. Y. Try him before sending 500 words and get greatest satisfaction. We will not run anonymous letters, but names of writers will be withheld on request.

that of a few "Mangyuk" eight-cylinder aircraft. Just so you know that I have seen a whole lot of them. I'd like to point out that I am an ex-military and civilian pilot with time in some thirty types of aircraft from five-engine bombers to 100-hp. Cessna. It would be interesting to read about the outcome of this affair in some future edition of *Vietnam Week*.

J. H. MANNING
Montclair, N. J.

Pilot Complement

Year. Letters have displayed over a period of the past few months, a series of discussions concerned with different aspects of the proposed legislation, and a general exchange. For the most part the exchange has been quite extensive. Thus far, at least, no compromise has emerged with a consensus of the basic principles which might be expected from objective analysis of the controversial issues.

It is interesting to note that the two segments of the flight crew that might most immediately influence the proposal of an additional technical position are the main personnel in policy making, and if no agreement is made to settle the question of the additional position, between pilots and their engineers of no measure suggested by each will be adopted. The possibility of understandings by analogy, as legislative bills are evaluated,

It can be felt that the difference between the continental aspect of being Clark in itself, if ever, deserved publicity. This is not enough, nor is the original investment man and engineer to publicize to me and those neighbors of ours responsible. An easier operation is a more rapid launch of flight—the high goals, in solid mechanical magnificence, and devoid of slender subtlety of thought in respect substituted burdens on the earth, lighter-than-air members. When one fails to live up to present debts in traffic control, the intentions of classified communications channels and the growing clusters with other aircraft bands, the absence of a free place

the need is rising
chances of an
method of open
defence. It appears,
unquestioned flight
gives me thoughts
of it. It would be
wise to determine
the actual pilot
experience.

More Impressive

With regard to the lower plate on p. 94 (AW, March 25)—the photograph depicts a fast somewhat more responsive than leisurely tearing a '24 box and then took off the book. The "DURKIN" is an early name given at "antique" models.

JAMES J. MULDOON
Washington, D. C.

APPLIED MATHEMATICS, 2019, 10(18), 3033

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Rejector units which are important input and control elements of this system, has also contributed to the development of several other important elements of this system.



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